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MODERN METALS

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INGOT STRIP

UGS CANS

COORS' CANS . . . Aluminum's foot-in-the-door of the 60-billion unit-per-year canning market

(See page 62)

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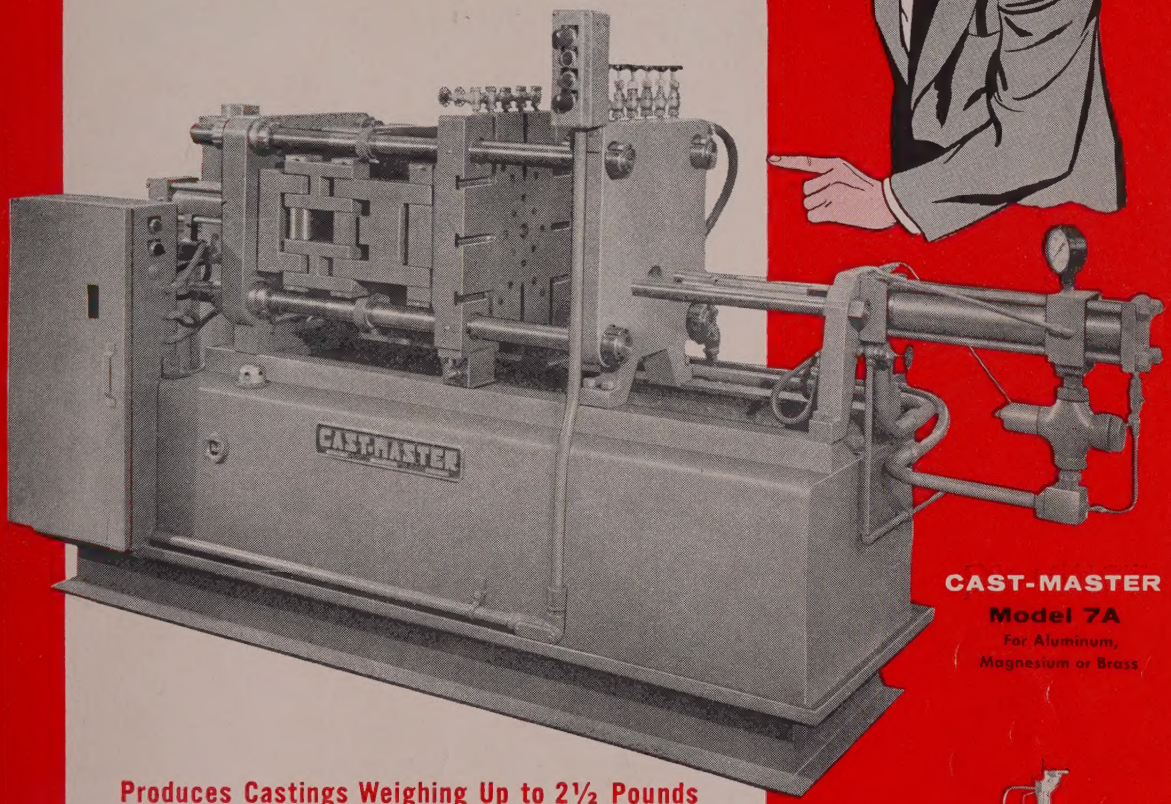

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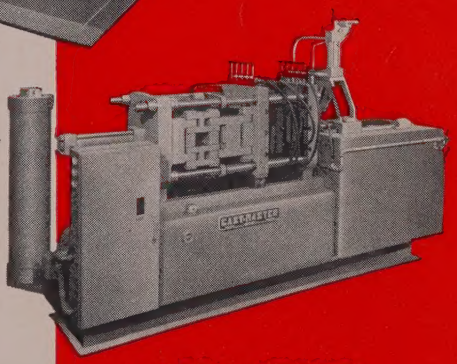

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Midwest Rep. C. W. Stone Co., Minneapolis, Minnesota
Western Rep. Sydney J. Wills, 2120 Strand, Hermosa Beach, Calif.
Central-West Rep. Earl L. Johnson, 1696 Webster Lane, Des Plaines, Illinois

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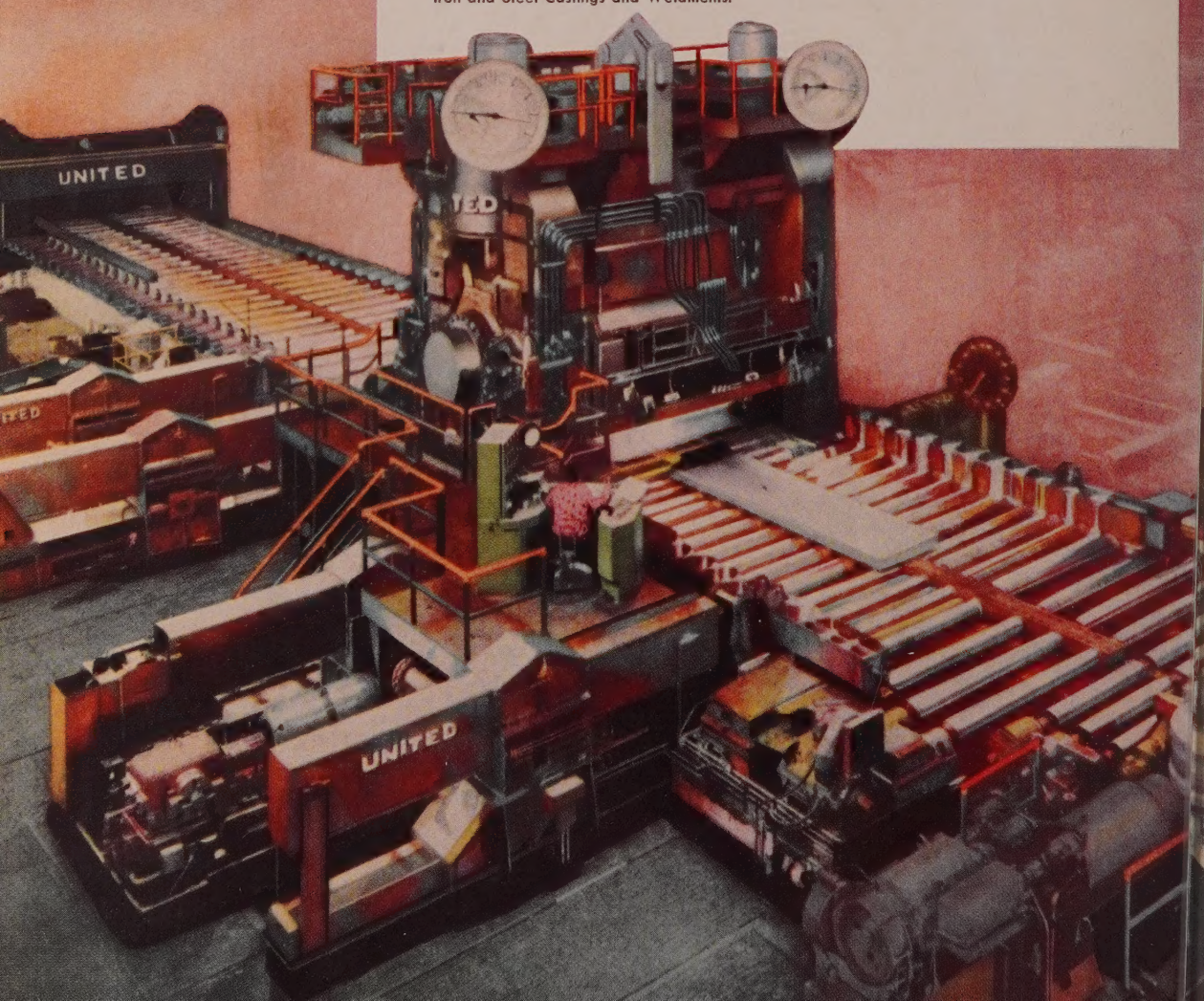
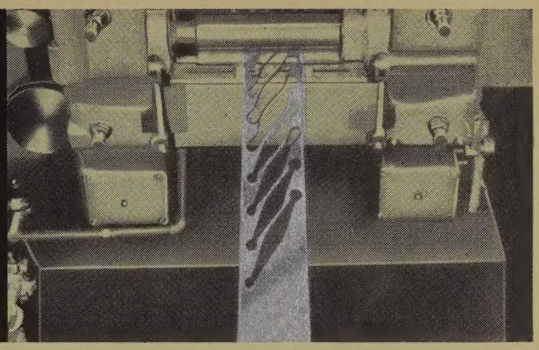


Forming Aluminum

...some tips to save time and waste



There's no special trick to working aluminum. It's a light, easily workable metal that requires no "babying", no special equipment to draw, and often, less power. Here are tips to make your aluminum-forming more efficient, more effective:

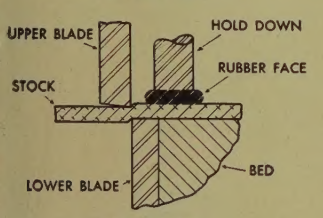
SHEARING AND SLITTING

Use the same methods to shear and slit aluminum alloys as for any other metals. Guillotine shearing calls for certain precautions, however:

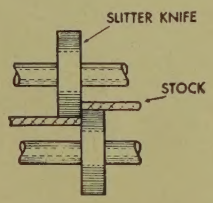
1. Face hold-down pads with rubber or other material to prevent marking aluminum sheet surface.
2. Use closer clearances between guillotine shear blades for "–0" (annealed) aluminum than for tempered and heat-treated metal.
3. Slitter knives should have a clearance of 0.0015" for all alloys and tempers. No rake is needed for slitter knives.
4. Determine shearing energy with this formula:

$$\frac{LtVS}{2{,}000} = \text{Shearing Energy, inch tons}$$

L is length of cutting edge, inches
t is thickness of material, inches
V is working stroke, inches (penetration to effect shearing)
S is ultimate shear strength of material, lb. per sq. inch



SHEAR SETUP



SLITTER SETUP

BLANKING

Except for punch and die clearances, the blanking of aluminum sheet is the same as for any other metal. In practice, clearances are closely related to the shear strength of the metal. The table below can be used to determine punch and die clearances for various material strengths.

BLANKING TOOL CLEARANCES

Shear Strength, PSI	Die Size
Up to 10,000	Punch Size + .12t
10,000 to 12,000	Punch Size + .13t
12,000 to 15,000	Punch Size + .14t
15,000 to 18,000	Punch Size + .15t
18,000 to 24,000	Punch Size + .16t
24,000 to 30,000	Punch Size + .17t
30,000 and Up	Punch Size + .18t

Punches used for blanking aluminum may be of annealed tool steel; dies, of hardened tool steel. Surfaces of both should be ground. You can reduce press loads by angle-grinding the die or punch-face. If the blank is to be kept flat, angle-grind die; if material is to be flat, angle-grind punch. Mount blanking tools on guide pin die sets.

Normally, you can blank aluminum on conventional tools, unless your production is small. In this case, you can use continental or steel rule type dies. The shearing edges of blanking tools and the metal should be kept well lubricated. Material with a low shearing strength requires a heavier lubricant.

Shearing energy for blanking can be determined with the formula given above. You can figure blanking pressures with the following formula, based on using flat punches and dies:

$$\frac{LtS}{2{,}000} = \text{Maximum blanking pressure, tons}$$

L is length of cutting edge, inches
t is thickness of material, inches
S is ultimate shear strength of material, lb. per sq. in.

As mentioned above, blanking pressures can be reduced by angle-grinding punches or dies. These pressures can be figured with this formula:

$$\frac{\frac{LtS}{2{,}000} \times t}{t + Sh} = \text{Maximum blanking pressure, tons}$$

Sh is amount of shear, inches

PIERCING

The procedure outlined above for blanking, applies to piercing aluminum, too—except for punch and die clearances. Keep piercing and perforating clearances to a bare minimum. *We suggest that die size be punch size plus 5% of metal thickness.*

Provide enough die relief—at least 0.75°—for quick "get-away" of punchings. If you try to pierce holes smaller in diameter than the metal thickness, you're likely to break a lot of punches. You can get smooth sheared edges on small pierced holes, like reamed holes, if you pre-pierce slightly under-size, then "shave" to the required finished size with angle-ground punches.

For more complete information on all phases of forming, or for immediate help on any phase of production with aluminum, call your local Reynolds office, listed under "Aluminum" in your classified phone book. Or write Reynolds Metals Company, P.O. Box 2346-KL, Richmond 18, Virginia.

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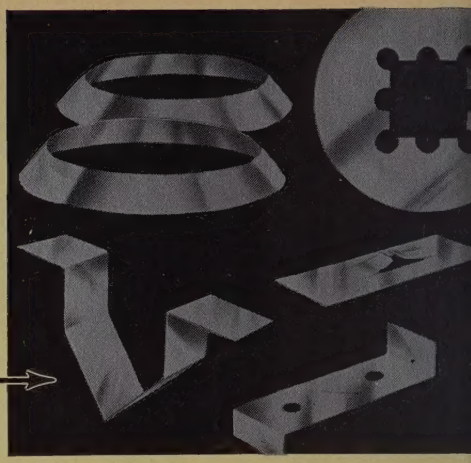
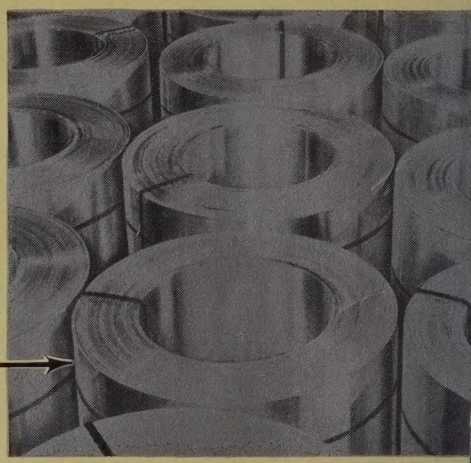


And you want a ready
source of coiled
aluminum sheet like this...



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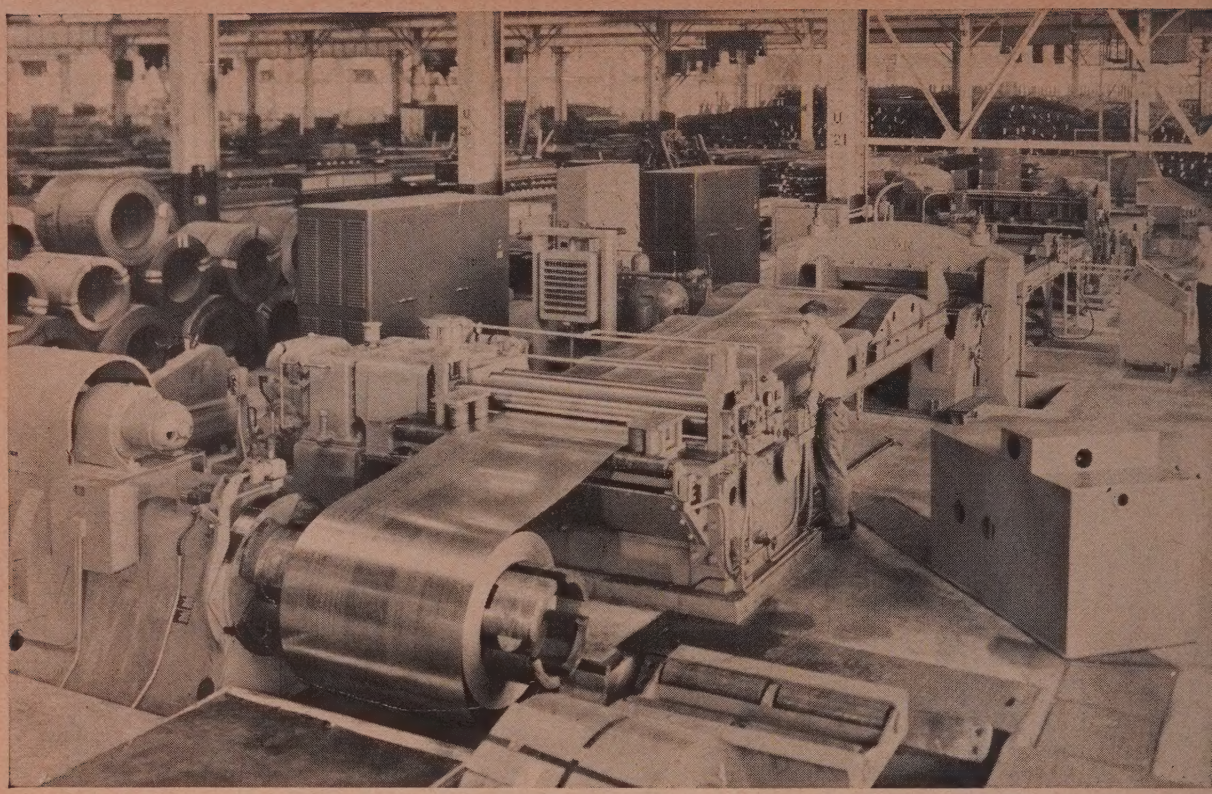

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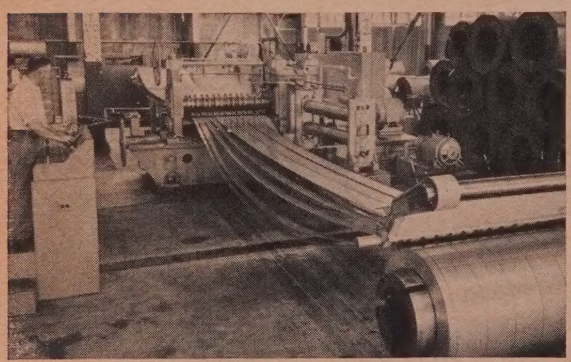

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MODERN METALS

Read in companies that produce, fabricate and cast aluminum, magnesium and titanium, and firms that use these metals in manufacturing end products.

N THE COVER: A major goal of the uminum industry has been wider penetran of the canning field. With the comtion of the Coors development program, uminum has taken a major step toward eater acceptance by users of cans — not the brewing industry alone, but in the st group of industries that consumed me 60 billion tinplate cans last year. The ors story starts on page 62.

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Key to Ford Motor Co.'s volume production of die and permanent mold cast automotive parts is large Lindberg melting and holding furnace installation.

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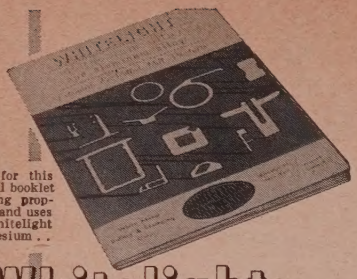

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Letters

ALUMINUM SHEET MILLS

Sirs:

Do you have any ideas of the number of aluminum sheet mills that are operating in the U. S. A. at present?

"W"—Massachusetts

MM—The primary producers operate 18 integrated rolling mills. In addition, there are 21 non-integrated mills that make sheet and/or foil.

There are also about 24 or 25 firms that reroll sheet or coil — mostly for their own products. This latter group is growing rapidly.

BRITISH ALUMINIUM

Sirs:

. . . What's all this talk about American producers trying to buy the British Aluminium Co.? Is this a policy reversal on their part . . .?

"J"—Michigan

MM—For details see the report starting on page 84 of our January issue.

It looks as if Reynolds Metals picked off a real bargain — but time alone will tell.

DATA ON DEEP DRAWING ALUMINUM

Sirs:

What would be the chance of receiving copies of any literature and/or technical information you might have regarding deep drawn aluminum . . .

"N"—Massachusetts

MM—We have sent you several article reprints on the subject.

Better not overlook the aluminum producers for this type of information because some of them have books on the subject. Suggest you contact Alcoa, Kaiser, Reynolds, Aluminium Ltd. and Olin as well.

"SWISS CHEESE" ROOFING

Sirs:

I read with marked interest the excellent feature article in your January issue on National Homes Corporation's aluminum home. However, I am deeply concerned because of some of the things that have been happening to aluminum in the roofing phase of our business.

I am enclosing a photograph (see cut) I just took of a completely disintegrated piece of .032 aluminum which was not on the roof over 6 years.

Seeing this picture may alarm you as much as the actual piece of metal did me.

"L" — Washington, D. C.

MM—We're alarmed, alright. But judging from the "swiss cheese" appearance of that hunk of roofing, we suspect that either (1) you were sold an extremely inferior piece of metal; or (2) it was improperly installed — in contact with iron nails, perhaps; or (3) somebody's been dumping lye or some other strong alkali on your roof.

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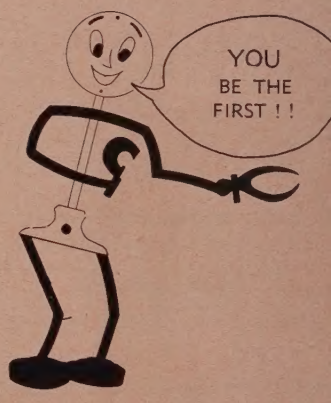

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Homes roofs you refer to could probably last that long, too, because they use the correct alloy, have an excellent protective and decorative paint system, and are properly installed.

WHO MADE THE CHAIRS?

Sirs:

I noticed in your December magazine an article on the Air Force Academy.

You said the main supplier of chairs, upholstered and molded, was Blair Chair, Marietta, Ga. Actually, Emeco Corp., Hanover, Pa., supplied 6700 upholstered chairs in four colors, and Blair supplied no upholstered chairs. Blair only supplied the molded chairs.

"W"—Pennsylvania

MM—Now you tell us! We sent Emeco two inquiries regarding their part in the Academy job. Nary an answer.

WANTED: HARDWARE

Sirs:

We are having difficulty obtaining hardware for our aluminum shower doors and glass sliding doors.

Could you put us in contact with manufacturers of the above?

"S"—Florida

MM—There are probably only a couple dozen outfits that would be more than willing to fill your needs. We'll gladly forward any replies to this firm.

ORMET IS RIGHT

Sirs:

I read with interest the article in your January issue entitled "Good Year for Light Metals."

We must, however, take exception to the paragraph wherein you mention six primary producers. Olin Aluminum is referred to, whereas I think that Ormet should have been mentioned.

In the event you wished for some reason to mention Olin, then Revere Copper & Brass, Inc. also should have been mentioned.

"H"—New York

MM—You're so right. In case any of our readers do not know it, Ormet is jointly owned by Olin Mathieson Chemical Corp. and Revere Copper & Brass, Inc. Our use of the name Olin Aluminum in place of Ormet could be misleading.

WHO MAKES CONCRETE MOLDS?

Sirs:

This is a request for information concerning manufacturers of aluminum molds for making concrete novelties. If you have their names and addresses it would be appreciated.

"P"—Kentucky

MM—Anybody make concrete molds of aluminimum? We'll forward your letters.

SOLAR HEATERS, ANYONE?

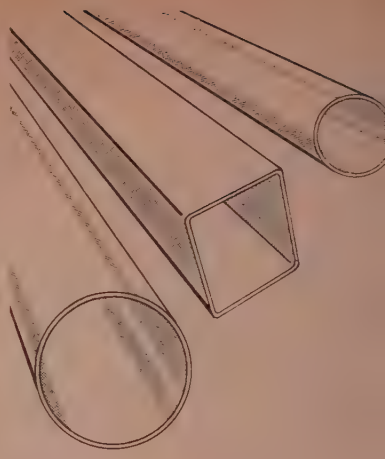
Sirs:

Could you put me in touch with some company that can give me the know-how on solar heaters — if possible using aluminum tubing and liquid similar to antifreeze?

I am a heavy user of aluminum in other fields.

"C"—Florida

MM—You've stumped us. Use of solar energy is an intriguing possibility, but we don't know of anybody who makes aluminum equipment for same. Maybe one of our readers can lend a helping hand.



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Here and There

Piggyback Buddies » » The increasing prosperity of America's motor freight lines, heretofore the cause of occasional agonized yelps from the railroads, doesn't bother them quite so much these days. The reason for a less plaintive attitude is the rising level of piggyback shipping, a salutary alliance of rail and motor freight service which can mean appreciable savings to big shippers because of reduced handling costs. Whereas this new approach to freight handling had once been limited to the larger railroads, perhaps as many as 50 are hauling truck trailers on flat cars today. Last year the roads took a beating as the recession bit into their business. Yet, piggyback loadings achieved a record 276,767 cars, compared with 249,000 cars hauled in '57. Result is that leading members of the truck trailer industry have started building piggyback type trailers and containers, while the railroads and such car builders as Pullman and ACF are building flatcars specially designed for the piggyback job. The piggyback development has already had a favorable effect on aluminum sheet and extrusions consumption and it's bound to increase year by year.

Irrigation Pipe at High Speed » » An interesting development is reported from York, Neb., where Kroy Metal Products Co. is continuously forming, welding, finishing and cutting irrigation pipe at the rate of about 1500 feet per hour. Gordon & Morgan Machine Co., Lincoln, Neb., designed the equipment which takes .051-in. thick aluminum sheet at one end, turning out 4- 6- and 8-inch diameter pipe at the other. First the edges are power-brushed, then rollers form the sheet into pipe; other rollers hold the edges closed as the pipe passes under a water-cooled tungsten-arc torch and is fusion welded at a speed of 300 inches per minute.

Another Modern Metal? » » Bureau of Mines metallurgists at the Albany, Ore. laboratories have succeeded in producing ductile yttrium metal. Long considered too brittle for structural uses, Bureau men transformed the metal into pliant foil as thin as the household aluminum variety by ridding it of dissolved gases. The high purity yttrium made by the Bureau contains only about .02% oxygen, which is the principal element limiting ductility. The technique for achieving the high purity required for ductility is similar to the famed Kroll process which the Bureau of Mines engineered from laboratory to commercial scale for titanium and zirconium. While this method doesn't reduce the cost of making yttrium metal, it will not increase it significantly, the Bureau said. The Atomic Energy Commission has been cooperating with the Bureau on the Yttrium project. AEC people believe the new, easily formed yttrium may supply answers to difficult problems in reactor and missile design.

Aluminum-backed, We Hope » » The time might not be very far off when the porcelain enamel

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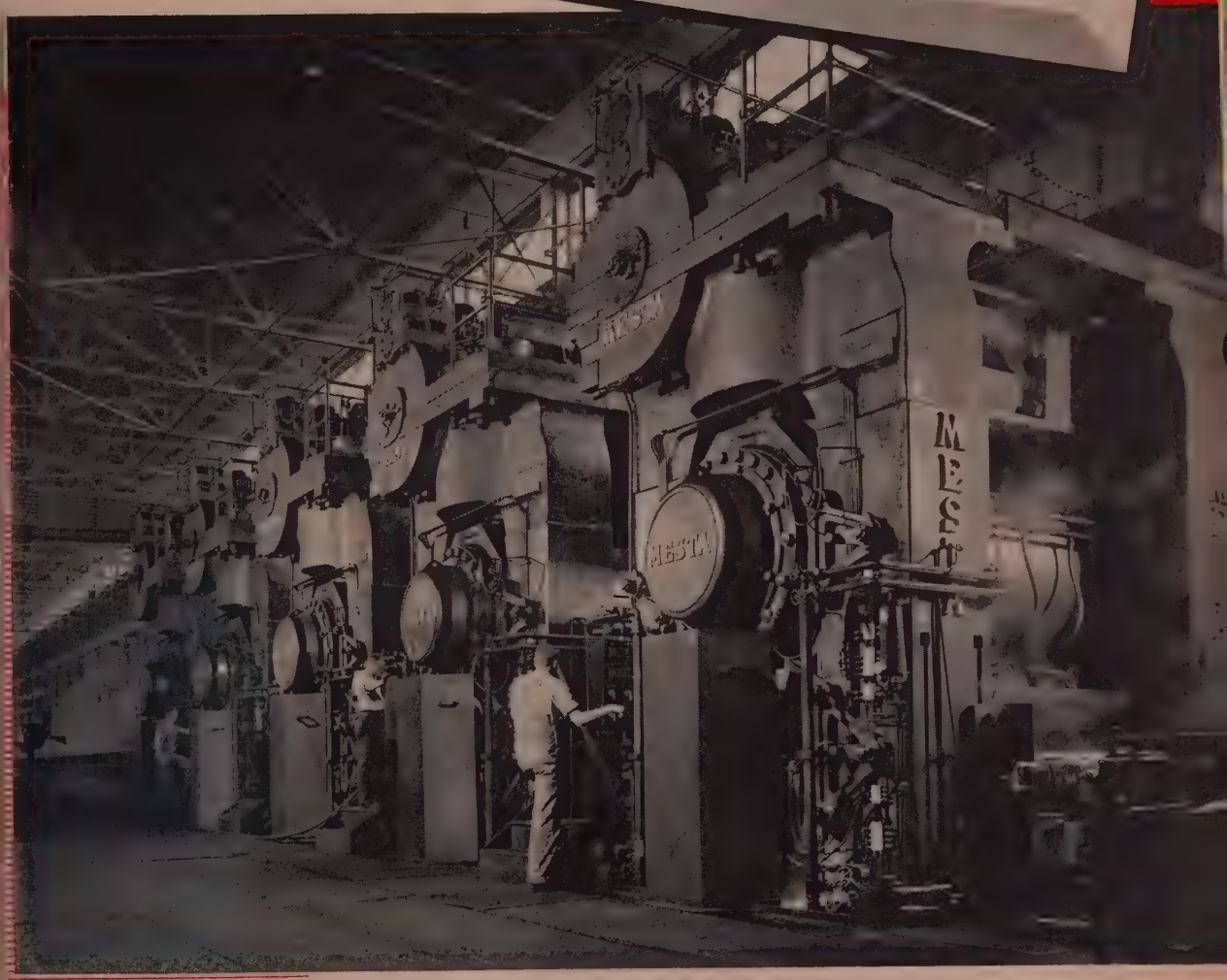

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for the production of wide Aluminum strip sheets

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PITTSBURGH, PENNSYLVANIA

shell for residential structures will be commonplace. If this comes to pass, Ferro Corp., Cleveland, leading producer of porcelain enamel frit (the glass material which becomes porcelain when fired on aluminum or steel) will win the credit. So certain are the Ferro people that the all-porcelain enamel house is practical, they've retained the architectural firm of Carl Koch & Associates to design three such houses within the next six months. Ferro's Glenn A. Hutt, vice president and director of commercial development, said that this move is "the first phase of a man-stage progression towards what we hope will be the ultimate mass production of an all-porcelain enamel house as well as porcelain enameled modular residential building components." Koch is the designer of the famed Acorn, Lustron, and Techbuilt prefabs. He's a leading proponent of mechanization in the home building field who has often expressed the view that this area could benefit greatly from a highly industrialized building process which could substantially reduce the waste and inefficiency of present building methods.

Soviet Intelligence » » a newly designed, 70-ton gas turbine is reported to be supplying power for oil well drills in Soviet oil fields, replacing conventional turbo-drill units. It delivers 3000 hp, and is said to give drilling speeds three to five times greater than the older equipment. Aluminum is used extensively throughout and the unit is designed so that it can be transported in sections by helicopter to remote areas.

New Automotive Corrosion Studies Urged » » The chemical specialties industry was alerted to revised requirements for antifreeze and rust inhibiting compounds, once the aluminum auto engine comes 'round the bend. Leonard C. Rowe, of General Motors Research Laboratories' Chemistry Department, reminded a chemical specialties manufacturers group that the trend toward light metals is evident and "either chemical manufacturers will be prepared to provide materials which are effective in a light metal cooling system, or alternative methods of cooling must be found." Antifreezes and rust inhibitors that successfully prevent corrosion in present auto engines and cooling systems may not solve the problem in aluminum engines or radiators, Rowe said. Pitting and galvanic corrosion are sure to be more "prominent." He suggested that chemical manufacturers begin research programs to study: Effect of various types of water impurities on corrosion and inhibition; effect of heat transfer on metal corrosion; effect of surface boiling and hot spots on metal corrosion; effectiveness of inhibition in crevices and low velocity coolant areas; and effect on corrosion of service variables such as poor maintenance, anti-freeze reuse and driver habits. The auto industry is already investigating some of these factors, Rowe said. He also urged that a simplified qualification test be made available for commercial antifreezes. It would appear that the aluminum engine is *really* around that next bend!

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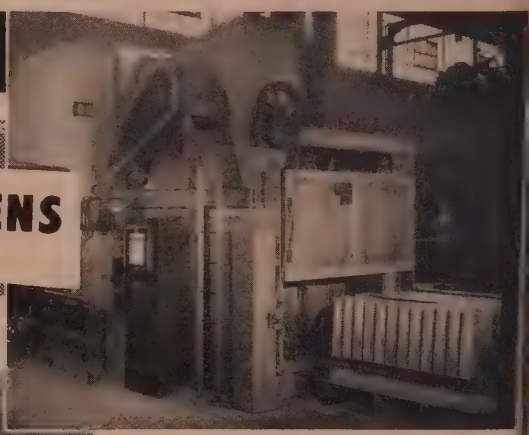

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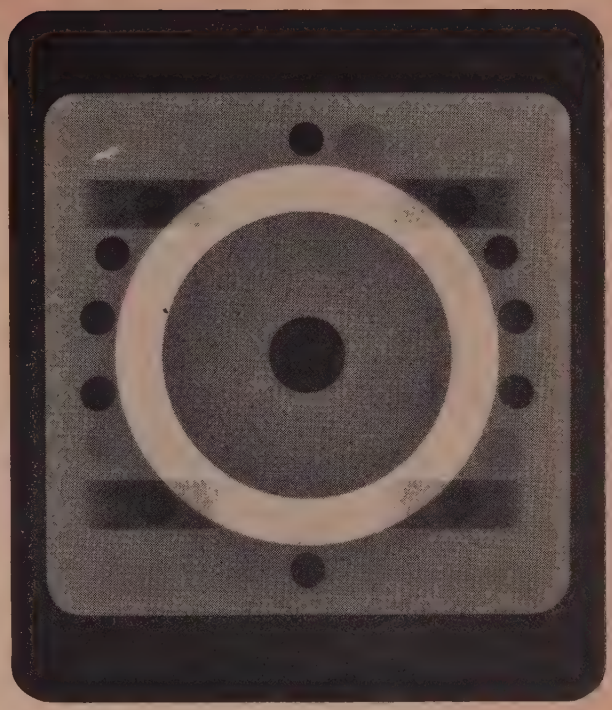
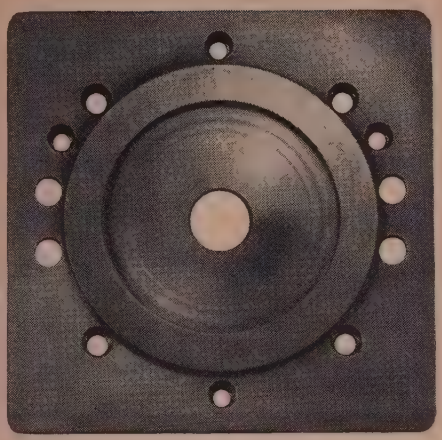
Radiograph shows porosity which caused markings to be fuzzy





Alloy casting for faceplate of aircraft instrument

End of a fuzzy face

SEE-AT-A-GLANCE clarity is an absolute *"must"* for aircraft instruments. So when one in development appeared with fuzzy numbers and index marks on its face, the cause and cure had to be found.

Sperry Gyroscope Company maintains a large and efficient x-ray testing department, hence the casting for the instrument face was promptly radiographed.

What the radiograph revealed was marked porosity. The conclusion was that the material used in applying the figures was being absorbed and sharp delineation was impossible. Therefore, a change in casting technic was indicated.

This is typical of the ways radiography helps the foundryman make sure only satisfactory work is delivered—make sure he is building and keeping a reputation for high-quality castings. If you would like to know how it can help you, call your x-ray dealer—or the Kodak technical representative—and talk it over.

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Read what Kodak Industrial X-ray Film, Type AA, does for you:

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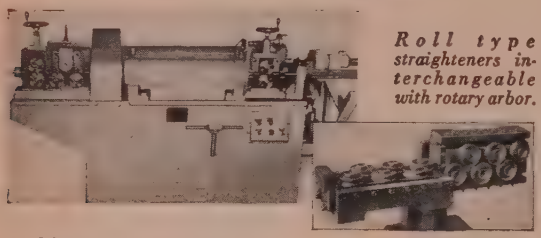

Roll type straighteners interchangeable with rotary arbor.

These new SHUSTER wire straightening and cutting machines incorporate new advantages to give you higher production — for less cost. The 2ABV variable speed unit straightens and cuts round wire from 3/16" to 3/8"; the 2ABVF straightens and cuts shape stock up to 1/4" square.

The new machines include an improved, vertical drive 5-roll gear driven preliminary straightening unit, and feed roll housing, both Timken bearing equipped. The new SHUSTERS can automatically cut lengths up to 14" at the rate of 140 pcs./min. and provide infinite variable speed within all feed and cutoff ranges. This machine may also be purchased as a constant speed unit (150 F.P.M.).

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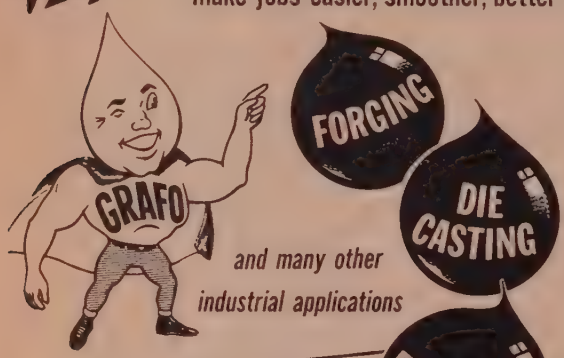

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Useful Data

The New JAco Spec-Lab, a precision spectograp for the laboratory, is described in an 8-page bullet by the Jarrell-Ash Co. The Spec-Lab comes in thr models with a variety of accessories. A chart gives t concentration range within which the Spec-Lab c determine the quantity of other elements in aluminu base and magnesium base alloys. The Spec-Lab grati and other special features are explained. Detail specifications of the standard model and wide ang models are charted. The Spec-Lab and all compleme tary instruments are easily arranged in 11 by 16-fo floor space. The booklet can be obtained from W. Davis, Jarrell-Ash Co., 26 Farwell St., Newtonvil Mass.

A new tank insulation method is described in brochure issued by the Nelson Stud Welding Divisi of Gregory Industries, Inc., Lorain, Ohio. The co pany claims a savings of 30 per cent is effected by u of the new method for installing insulation and jac eting on large storage tanks for hot materials. En welded studs, on which insulation and either aluminu or steel skin are impaled, are applied directly to th tanks or on lightweight strips that are then tack welde to the tanks. The method is said to result in improve tank appearance as well as cost savings. Write to Nelso Stud Welding, Division of Gregory Industries, In Lorain, Ohio for the booklet.

"The Mark of A Good Die Casting" names a si page folder issued by Doehler-Jarvis Division of N tional Lead Co. A table is provided to aid compani in selecting from the eight most-specified alloys for d castings. Advantages and limitations of zinc-, alum num-, and magnesium-base alloys are given in the char New product developments described are use of Ba tam-weight magnesium die castings to pack 5 hp int a 19-lb. chain saw, and use of high precision Doehle Jarvis castings to house a movie camera to insure light-tight seal. A copy of the folder and table ma be obtained from Gene Brissie, Doehler-Jarvis, Div sion of National Lead Co., Smead Ave., Toledo 1, Ohi

The Beryllium Alloy Product Directory is off th press from the Brush Beryllium Co. The directory printed in the form of seven charts. Two of these li availability, sizes, and nominal composition of mast alloys and casting alloy ingot. Three are concerne with wrought beryllium-copper alloys; and the tw remaining detail casting alloys and wrought alloys. F a copy write to L. Dean Alspach at the Brush Ber lium Co., 4301 Perkins Ave., Cleveland 3, Ohio.

Seamless Aluminum Tube Packaged in Coils is t subject of Data Sheet No. 1481, issued by United W and Supply Corp. The All-Purpose Aluminum Tu referred to is packaged in cartons of ten 50-ft. co each. A table gives capacity cubic volume in cu inches per ft. of length, and safe bursting pressure

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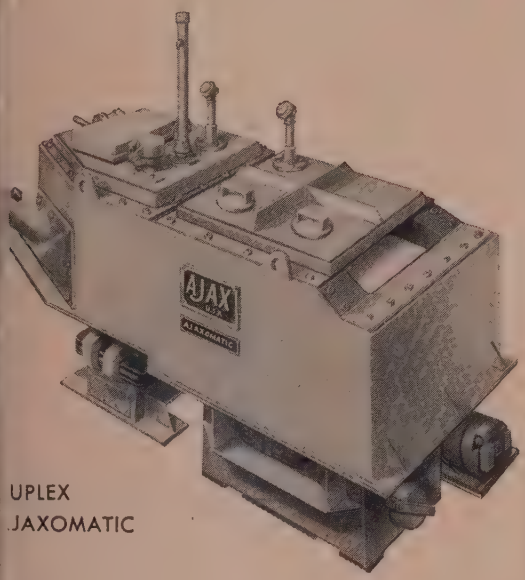
AJAXOMATICS

bring automation to die casting



UPLEX
JAXOMATIC

The Duplex AJAXOMATIC melts aluminum pig and gates right at the die casting machine. By pushing a button the operator initiates the complete casting cycle: the die closes and the Duplex AJAXOMATIC pours the exact required amount of molten metal directly into the cold chamber. The operator just removes the finished casting at the end of the cycle.

Automation, however, is only part of the AJAXOMATIC story. The Duplex AJAXOMATIC also gives assurance of consistent quality. The quality of a finished casting begins with the proper melting of the metal. 60 cycle induction with its two basic features of internal heating and electromagnetic stirring is used exclusively in the Duplex AJAXOMATIC. Here are the unique characteristics of the Duplex AJAXOMATIC:

Precision temperature control — at low temperature	No supply ladle system or hand ladles
Alloy uniformity — no segregation	Precise weight of automatic pour
No gas porosity	Comfortable working conditions
Low metal loss	Low maintenance

The standard Duplex AJAXOMATIC is rated 120 kw to produce 500 lbs per hour of castings ranging from ½ lb to 30 lbs. Other AJAXOMATICS are available to suit a wide range of production requirements, including units supplied from central melting systems. May we have an opportunity to study your requirements?

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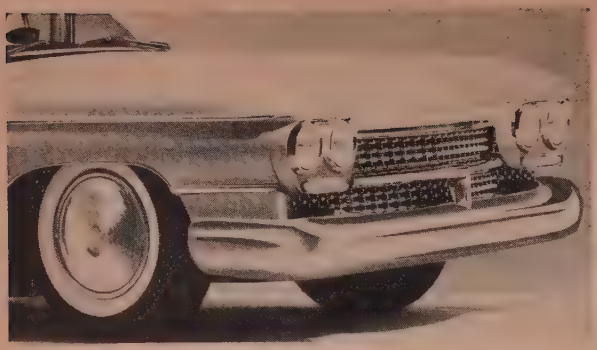
60 CYCLE INDUCTION MELTING

Associated Companies: Ajax Electrothermic Corporation Ajax Electric Company



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pounds per sq. in., for various tube sizes. Size is ex pressed in terms of outside diameter and wall thick ness. Sales offices and representatives for areas all ove the country are listed. Interested companies shoul write to J. G. Landrigan, United Wire and Suppl Corp., 1497 Elmwood Ave., Providence 7, R.I.

Parts Cleaning Equipment and ultrasonic cleanin are treated in a folder by G. S. Blakeslee & Co. Blakes lee combines its degreasers and washers with Branso Ultrasonic Co.'s "Sonogen" equipment for ultrasoni cleaning. Various models of this equipment are dis cussed. A drawing shows how parts are conveye through a Blakeslee ultrasonic degreaser and advan tages are listed for the use of this equipment. Anothe chart lists a few typical uses of Blakeslee cleanin equipment. For a copy of the folder write to R. C Gustafson, G. S. Blakeslee & Co., 1844 S. Laramie Ave Chicago 50, Ill.

"General Information Sheet On Foamalum" describe briefly the physical properties, possible uses of foame aluminum, and the process of casting foamed alu minum alloy. "It is hoped that the general informa tion will raise further specific questions for investiga tion," says Foamalum Corp., producers of commercia foamed aluminum tradenamed "Foamalum." D. R Miller at Foamalum Corp., 508 Water St., LaSalle, Ill will furnish copies of the General Information Shee

Titanium-Aluminum Master Alloy of High Purit is the subject of a Data Sheet issued by the Kaweck Chemical Co. Composition of the alloy is aluminu with 5% to 6% titanium. The sheet gives a specifi breakdown of elements contained and suggested use which include the addition of the alloy to aluminu melts to obtain alloying of titanium, grain refinemen and improvement of physical properties of casting This data sheet and two similar ones: one on tw Zirconium-Aluminum Master Alloys and one o Lithium-Aluminum Master Alloy will be furnishe upon request to Joe Abeles, Kawecki Chemical Co 220 East 42nd St., New York 17, N. Y.

Hydraulic press brakes for sheet forming and punch ing operations are detailed by O'Neil-Irwin Mfg. Co in an 8-page bulletin. The company's Di-Acro Hydr Power 25-ton series is described and specified with th aid of drawings. Directions for operating are give How special stroke adjustment and dual speed opera ing cycle with power work stroke work for peak ef ciency and safety is explained. Various accessories a shown. This bulletin on Di-Acro Precision metalwor ing machines, coded D-TFT, is available from O'Ne Irwin Mfg. Co., 3109 Eighth Ave., Lake City, Min

Straighteners for tubes and pipe, round bars, fla and shapes are the subject of Bulletin No. 25 issue by Sutton Engineering Co. Models for the high-spe straightening of non-ferrous tubes or round bars, heav duty straightening of these, and straightening a polishing cold drawn round bars and tubes are show A diagram of the working head of a 5-roll machi shows its engineering principle. The new cluster r

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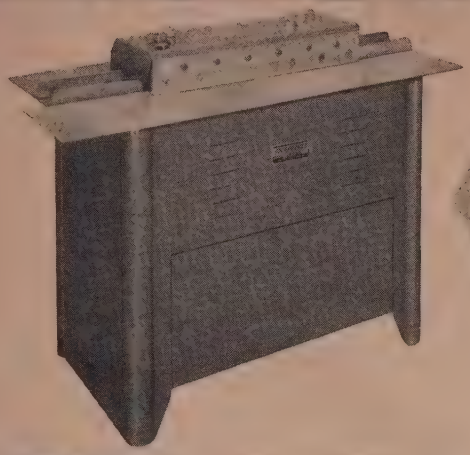
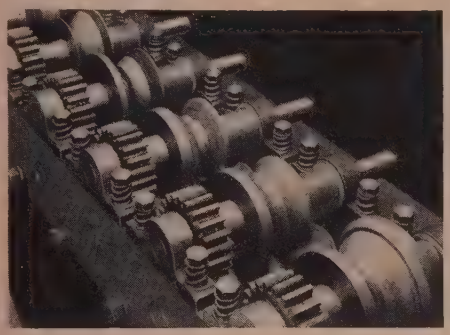
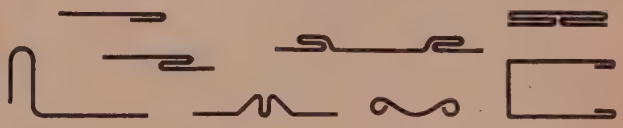


1 STANDARD LOCKFORMER CHASSIS



2 CUSTOM ROLLS TO YOUR SPECIFICATIONS



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For more than 21 years, Lockformer equipment has been proving its ability to save time and money in all types of forming operations—in both large and small sheet metal shops. A Lockformer can do the same for *you*.

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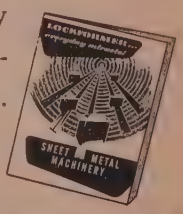

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In Canada: Brown Boggs Foundry & Machine Co., Ltd., Hamilton, Ont.

arrangement with automatic angling of rolls is pictured and the 7-Roll principle is illustrated and explained. Other Sutton equipment is shown briefly. Write to R. A. Bland, Sutton Engineering Co., First National Bank Bldg., Pittsburgh 22, Penna.

"Specialized Chemical Processing Compounds for the Metal Working Industry" is a 14-page booklet put out by Turco Products Inc. The company states that the book's purpose is "to serve as an outline of the Turco compounds most generally used in the metal working industry." Sections under which these are described are cleaning, processing, aids to processing, specialty products (such as rust preventives and aluminum specialties), flaw-detection process, and plant maintenance. Nine charts include measurement conversion tables, product specifications, directions for measuring surface areas, energy needed to heat water, and properties of steam. Write to C. F. Devine, Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif.

Ultrasonic Welding of Structural Aluminum Alloys is an 88-page booklet on results of research by Aeroprojects Inc. for the U. S. Navy by J. B. Jones and E. E. Weismantel. Continuous-seam type ultrasonic welding of structural aluminum alloys was shown to be feasible, and ultrasonic welding produced spot-type solid state junctions in various bare aluminum alloys, meeting the shear strength requirements of military specifications for resistance spotwelds. The joining process was effectively supplemented with heat at temperatures below the critical levels for aircraft structural aluminum alloys. Surface cleaning preparatory to the welding was shown to be less critical than for aircraft-quality resistance spotwelding. The booklet PB 131680, may be ordered at the price of $2.25 from OTS, U. S. Department of Commerce, Washington 25, D. C.

Anodized Aluminum, how it can be protected, preserved and cleaned before and during construction and maintained after occupancy, is discussed in a folder titled "It's Anodized Aluminum" by Acme Galvanizing Inc. Instructions cover the use of recommended wax and lacquer, and how to clean anodized aluminum. Of special interest to building contractors, aluminum fabricators, architects and building superintendents the information is to be included in a small folder attached to every shipment of architectural aluminum anodized by Acme. Companies or persons wishing the larger folder should address I. M. Herrmann, Acme Galvanizing Inc., 2730 S. 19th St., Milwaukee 15, Wisc.

Aluminum Brazing Salt D is the subject of technical bulletin H-25 from the Research Laboratory of Park Chemical Co. Aluminum Brazing Salt D with melting point of 970° F., working range of 1050° to 1200° F. and weight of 108 lbs. per cubic foot acts as both flux and heat transfer medium for all dip brazing operations on aluminum alloys. The sheet explains equipment and procedure for aluminum brazing. Some helpful hints on maintenance of bath are included. Write to C. R. Foreman, Park Chemical Company, 8074 Military Ave., Detroit 4, Mich., for a copy of the bulletin.

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Pictured: One of some 50 "BEC" continuous casting installations in the U. S. and Europe producing billets and slabs in multiple strands up to 30-ft. lengths.

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Above: A Tramer Installation Anodizing Aluminum Extrusions For One of the Country's Large Manufacturers

The tanks in this installation are 27 feet long. The rectifier has both automatic current and voltage control, and a capacity of 6,000 amperes at 24 volts.

One man operates the entire system.

Tramer engineers designed, furnished and installed the entire unit including the exhaust system. In this anodizing installation is an experience of twenty years of serving the equipment needs of the metal finishing industry.

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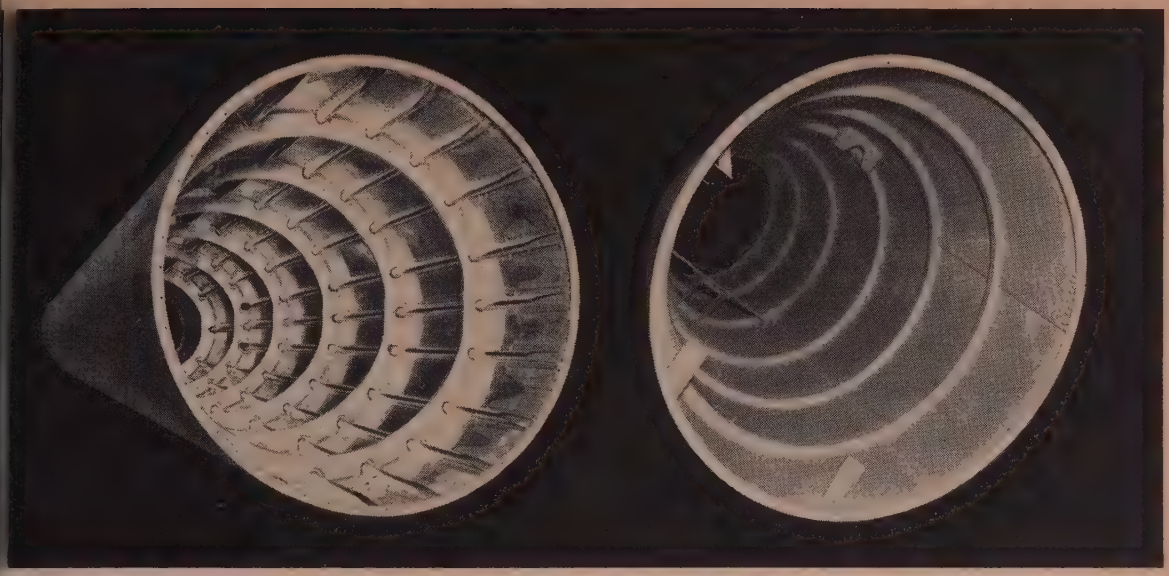
LIGHTWEIGHT DESIGNS

save more than weight

Designers reap a rich harvest of additional benefits as a result of lightness when they use magnesium. Bonuses such as more payload, simplified design, increased performance and reduced human exertion.

People who buy and use the luggag pictured above derive a very direc benefit from magnesium. As this ligh weight luggage is made of magnesium it saves human effort and fatigue. Als the reduction of weight means mo luggage can be carried without extr charge when traveling by air. Magn sium saves human exertion in oth products, such as ladders, power to housings and materials handling equi ment.

Another example of the many sa ings and extra benefits that magnesiu —and its resultant load lightening ma possible for the designer is in the aut motive field. One delivery truck u loads its last parcel and heads for t garage and the gas pump. Another, identical size, goes on to deliver ma



SIMPLIFIED DESIGN in magnesium aircraft part (right) was made possible by its advantageous stiffness-to-weight ratio.

lbs. of merchandise. Why? The
d truck is much lighter—its body
ıde entirely of magnesium alloy
plate and extrusions. *Because*
econd truck is lightweight, it can
more payload. Or, it can carry
ame payload as the first with less
smaller tires and less wear and
on the engine and transmission.
er trucks also save their owners
y on license fees, insurance pre-
ıs and over-all maintenance.

even more dramatic example is
of missile design. In one ballistic
le, the elimination of *one pound*
ccess weight contributes approxi-
ly 18,000 feet of additional alti-
and a comparable increase in
e! This means vastly improved
rmance wherever magnesium can
ıbstituted for heavier materials.

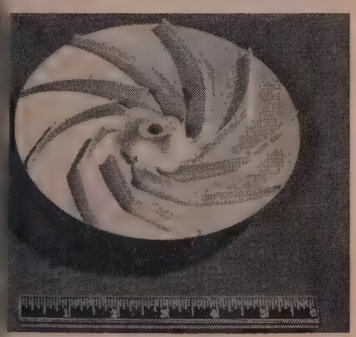
MAGNESIUM LIGHTNESS INCREASES STRENGTH, STIFFNESS

The designer who is seeking a stiff section can achieve it easily—and still save weight—with magnesium alloys. Magnesium weighs only 67% as much as aluminum, 25% as much as steel and zinc. A structure made of magnesium could be 8 times as stiff as the same part in steel if designed to equal weight. If equal stiffness is the design criterion, a magnesium section can weigh 62% less than steel and 25% less than aluminum.

Aircraft manufacturers have learned to exploit these facts to the fullest in conserving precious airborne weight. Critical parts such as wing and tail structures can be designed with more than adequate stiffness for high speed flying conditions. And, in addition to weight savings, magnesium helps provide a smooth aerodynamic surface and reduces "flutter" and "drag". Most important, the use of more rigid magnesium sections simplifies design by eliminating many of the stringers and stiffeners necessary with other materials.

★ ★ ★

WRITE TODAY for new brochure, "Magnesium Design". For your copy of this valuable reference for designers, contact the nearest Dow sales office or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Magnesium Sales Department 1340 CQ 2.



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magnesium was able to meet the re-
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New Enterprise

Extruded aluminum is combined with plastic, other metals, or fabric surfaces in solid or partial walls by the Curtis Office Partition Co., 103 Union St., Brooklyn 31, N. Y. The company offers four basic styles of walls in 10 standard stock widths from 12 to 66 in. and four standard heights from 42 to 72 in. They're called Aluminettes, come in a variety of textures and colors.

Two new pig alloys have been added to the Reynolds Metals line of aluminum master alloys and hardeners to help sand and permanent mold shops reduce costs of casting alloys 355 and 356. The two alloys, 2351 and 2370, can be made into alloys 355 and 356 respectively by the addition of magnesium during melting operations. This can save 2½ to 3½ cents a pound, according to Reynolds.

Slide viewer manufactured by the Grimes-Noden Corp. of Cheshire, Conn., utilizes an aluminum extrusion for the body section of the case, instead of the conventional plastic. Model 101 fits into a vest pocket, comes in natural metallic color of aluminum. Deluxe model is gold anodized aluminum. G-N buys 12-ft.-long extrusions, cuts them into two-inch lengths.

Units consisting of nickel-plated steel racks and aluminum **tote boxes**, and known as Load Luggers, were developed for food handling and industrial applications by McClintock Mfg. Co., 802 W. Whittier Blvd., Whittier, Calif. Protrusions on sides of the tote boxes hold them to slide rails. Each rack holds six boxes measuring 8 in. deep by 12½ in. long.

The French aluminum producer, Pechiney, is constructing a 50,000-ton **aluminum plant in Angola, Portuguese** African territory, as the result of an agreement with Aluminio Portugues (Angola) S.A.R.L. Pechiney will be a partner in the enterprise.

Vacuum Research Co., 420 Market St., San Francisco 11, Calif., added a new **aluminum valve** to its Series VG vacuum valves. VG-3 measures 4 in., with flanges of 9¼ in. or 11 in. or combining the two sizes on opposite faces of the same valve.

"Sightsaver" **lamps** in gold-anodized aluminum save space, can be quickly attached to walls by means of the bracket supplied. The supporting arm rotates 180 degrees and is adjustable up or down. Lamp shade is washable vinyl plastic. Maypole Clamplamp Co., 7 Delaware Ave., Youngstown, Ohio., is the manufacturer.

An Automatic **Mail-Box Signal Flag** made of aluminum by Autotray Co., Inc., 3901 East 26th, Indianapolis, Ind., indicates whether or not mail has been left by postman, saving steps for the housewife in rural areas. Alloy 5052-H34 has ductility to enable staff to bend to angles, yet is stiff enough to support sign

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flag. The manufacturer specializes in aluminum underdash and window trays for autos.

"Twin Thermo Fins," made of aluminum, enable home owner to make his own **baseboard radiator** by attaching ¾ and 1 in. pipe or 1¼ or 2-in. pipe for hot water or steam. Heat output is increased as much as 600% according to the manufacturer, Lancaster Engineering Co., 470 Main, Lancaster, Pa. Twenty-four of the twin fins will make a 2-ft. radiator.

Daytona Beach, Fla. is the site for **two new aluminum fabricating plants.** Trainor Metal Products Co., Auburn, N.Y. has leased 10,000 sq. ft. for the manufacture of aluminum furniture and sporting goods; the company will employ 20 to 40 workers. A new company, Marine Hazards, Inc., is erecting a 12,000 sq. ft. building at the municipal airport on 3½ acres which it has leased for making a safety device for outboard motors – a circular shield of high strength aluminum alloy to surround the propeller.

The 'Retemba' collapsible railway **container** with an extruded aluminum framework collapses to 17% of its overall size. Bofors Co. in Sweden developed the product which is being made by Warwick Production Co. It withstood over 100 journeys without damage in recent tests. The 5.8 cu. ft. size weighs 37 lb. and the 3.9 cu. ft. size weighs 29 lbs.

Anodized aluminum magnet wire for use at temperatures to 500°F or more is being produced by Aluminum Wire and Cable Co. Ltd., Port Tennant, Swansea, England. Wire gage sizes are from .064 in. to .0076 in. at prices of roughly 70c to $1.50 per pound. The wire is reported to have good heat-transfer qualities as well as excellent heat resistance.

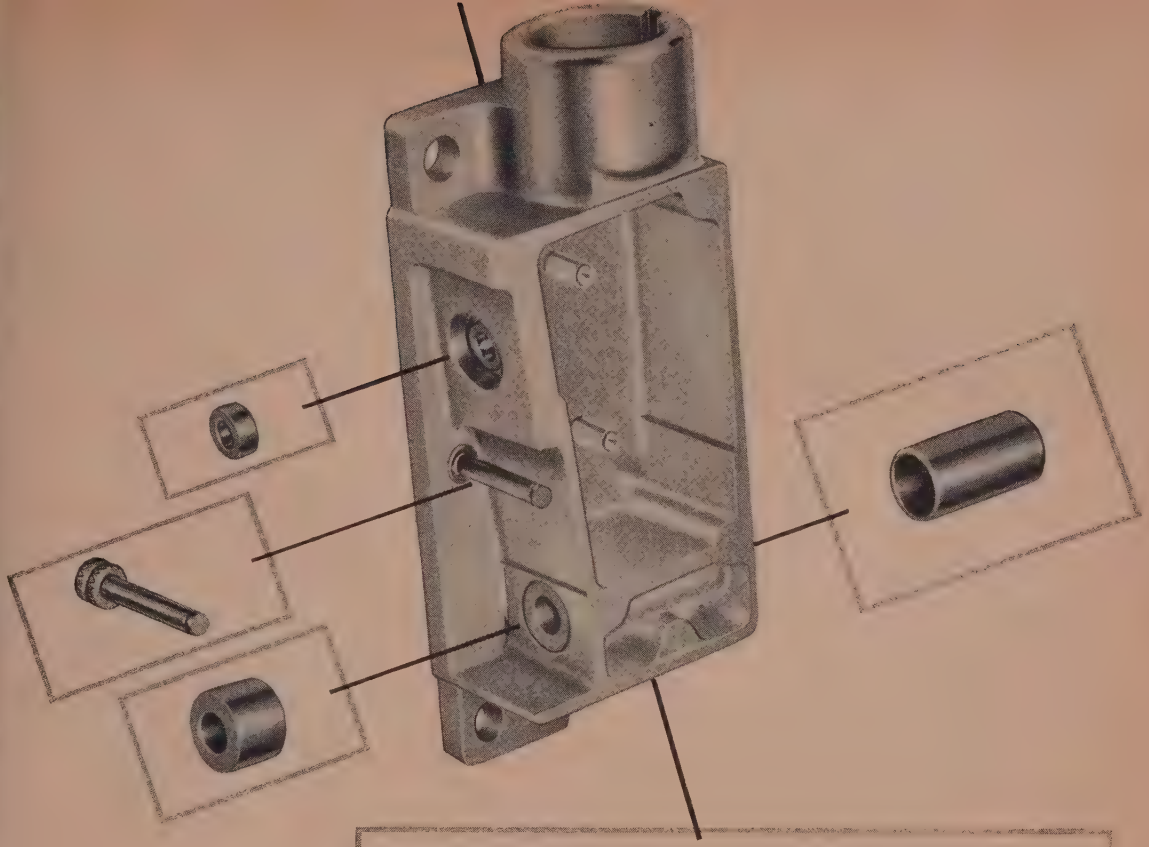
A new **soldering flux,** developed by American Solder & Flux Co., 19th & Willard Streets, Philadelphia 40, Pa., promotes capillary action on aluminum. Flux is used to join aluminum to aluminum or to other metals. Operating temperature is from 600° to 675° F. Residue may be removed with water.

Half-inch diameter **collapsible tubes** with elongated nozzles are 10% cheaper than pure tin when made of aluminum. Venesta Ltd., British manufacturer of foil and collapsible tubes, developed the aluminum tubes by modifying small diameter extrusion presses to make the alloy flow in the nozzle forming dies.

To allow excess moisture to drain from meats while cooking, **perforated pan inserts** which rest 1 in. from bottom of pan are made of aluminum in a variety of pan sizes by McClintock Mfg. Co., 802 W. Whittier Blvd., Whittier, Calif.

Shimming made from laminated sheets of .003 in. thick aluminum held together with a bonding material is adjustable in thickness. Two types, Laminum and Lamisol, are made by Laminated Shim Co., Glenbrook, Conn.

Various **tools** for processing concrete are made of cast magnesium alloy by Haivala Concrete Tools, Inc., 1017 Walker, Wichita, Kansas. Aluminum handles in



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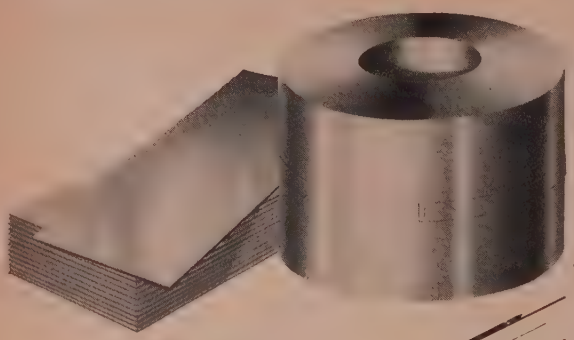

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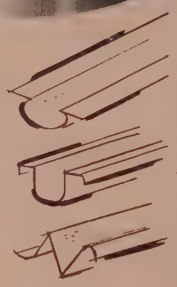

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4 ft. and 6 ft. lengths attach to the concrete processing float, corrugated float and combination float. The original tool by Haivala was a magnesium alloy hand float which is still popular with cement contractors.

The Erecto **Aluminum Booster,** manufactured by Lamson Corp., Syracuse 1, N.Y., helps in loading and unloading trucks. Three lengths are made: 11 ft. 8½ in., 14 ft. 2½ in. and 16 ft. 8½ in. The slider bed, made of ⅛ in. aluminum is 5 in. deep and 19 in. wide; belt is 14 in. in width. A ½ hp reversible motor furnishes power for either direction.

A special cast **aluminum manifold** supports valves for controlling movement of cylinders moving rapidly on automated equipment and requiring controllable cushioning at any point in strokes of cylinder. The pre-assembled unit, made by Valvair Corp., 454 Morgan Ave., Akron 11, Ohio, has full-length conduit passage for electrical wiring, with a removable cover for access.

Universal shim-nuts, used instead of stacked shims under nuts, cut down weight and assembly costs. Units have serrated aluminum housing, tubular spaces and stop nut or all-metal lock nut. Spacer is press-fit into the holder after the nut has been inserted, making a single unit. Different heights are distinguished by color coding. Manufacturer is William H. Snow Co., 1413 E. Franklin Ave., El Segundo, Calif.

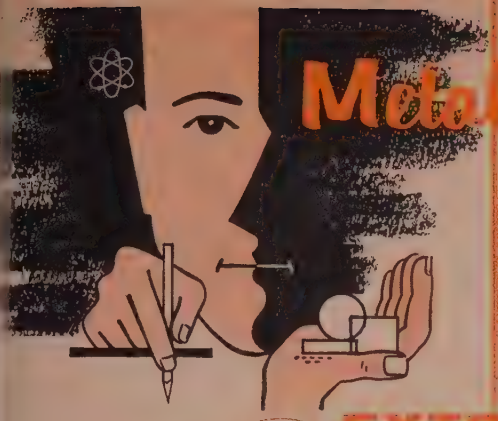
A non-breakable **meat thermometer** made of aluminum by Thermometer Corp. of America, 569 Pleasant, Springfield, Ohio, shows on one dial recommended cooking temperature and actual temperature of roasts during cooking. Aluminum insures rapid heat transfer for accurate temperature measurement, the manufacturer says.

An **aluminum closure** manufacturer by Alka Co., Crawley, Sussex, England seals uniformly around rim of bottle, with less pressure than is required for tin plate and less risk of breaking bottle. It is strong enough to withstand normal pressures of carbonated drinks, yet is about 10% smaller than conventionally designed bottle caps.

A "Baby Anchor," special **chair** made in aluminum by Wallace-Davis Co., Hamden, Conn., holds a slippery, wriggling child in the bathtub. Four suction cups on the chair attach it to the tub. Adjustable belt is plastic. Seat has nonabsorbent vinyl foam cushion. Baby Anchor is made in white, mint or maize color.

For families who want an "outside living room" or pool-side lounge, SeaView Industries, Inc., 4030 N.W. 29th St., Miami, Fla., manufactures **Playtime Patios.** The aluminum shelter, which won't rust or leak, comes in a choice of ten baked enamel colors.

The Amick Suspension Ambulator is a **therapeutic device** which helps paralysis patients walk again, by eliminating fear of falling and encourages natural walking movements. Amick Ambulator Co., Stanton, Neb., makes the aluminum unit.



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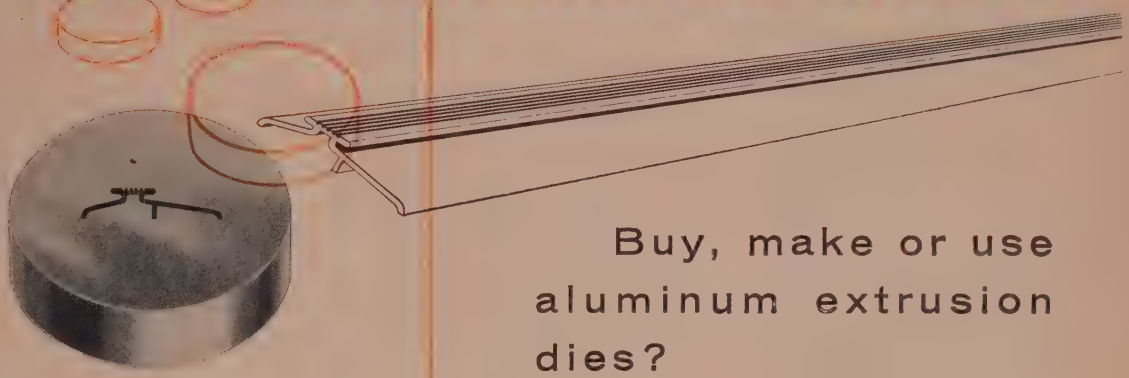

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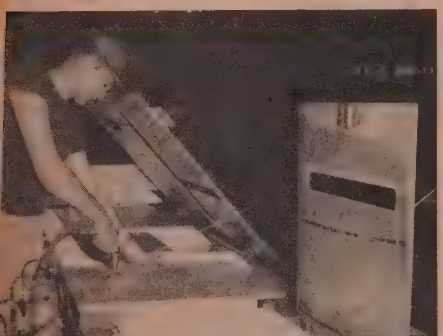

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a versatile new sandwich material with a very high strength/weight ratio exceptional stiffness and dimensional stability superb insulation value, and excellent moisture resistance. Alcoa calls it Alply; sees a strong market potential in construction, homes, trailers mobile homes, appliances. Westinghouse presently uses it in manufacture of two new refrigerators

A NEW structural material consisting of expanded polystyrene foam, sandwiched between two sheets of aluminum, bids fair to revolutionize the design and construction of major appliances, homes, buildings, trailers, mobile homes, and many other products. Called Alply, and developed by Aluminum Co. of America, the material is already being used by Westinghouse Electric Corp. in the production of refrigerators.

By combining the best characteristics of both aluminum and foamed plastic, Alply possesses a formidable array of advantages. It is very light in weight and boasts high strength, stiffness and dimensional stability. The core material is white, opaque, odorless, nontoxic, and self-extinguishing. It will not support plant or animal life, and is highly resistant to moisture absorption. Combined with aluminum, it makes an excellent insulator against heat and noise (see table on opposite page).

The aluminum facing plays an equally vital role. Besides presenting a tough, hard surface, it contributes strength, resistance to chemical attack, and beauty. It can be textured, formed and colored by a wide variety of methods to achieve an almost limitless choice of surface effects. It is also a stout barrier against moisture, gases and radiant heat.

← Five steps in production of a new Westinghouse refrigerator with Alply. From top to bottom: Panel is mitered and notched with radial arm saw; holes are drilled with hand-held air drill using hinged templates; refrigerator wrapper is formed by bending panel 90° at each miter in bending fixture; cabinet is placed in fixture and polyurethane foam is applied to joints; completed wall-type refrigerator-freezer with interior fittings and doors attached. Drawings on opposite page give simplified view of cabinet production.

To top it off, Alply opens new vista to design engineers. It permits the economical production of relatively short runs for market testing purposes, and enables manufacturers to tool up for new or redesigned products at a fraction of the normal tooling cost.

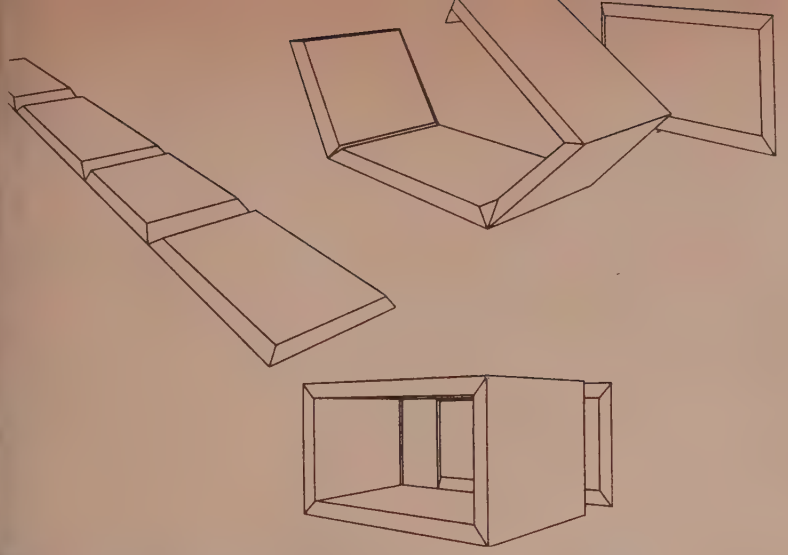
These last three advantages are conveniently exemplified by the two new models of refrigerators presently under production at the Columbus, Ohio plant of the Electric Appliance Division of Westinghouse. One model is a 13-cu ft. horizontal refrigerator-freezer which can serve as a built-in or counter-top unit. The other is a free-standing 5-cu ft. model.

Simple In-Line Production

For the cabinets of these appliances Alcoa supplies sandwich panel material cut to the proper widths and lengths. In cabinet production, Westinghouse uses ordinary power saws to notch or miter the corners. The sandwich panel is then folded into the cabinet shape and the inside corners are sealed with plastic. The rest of the refrigerator work is completed by conventional methods.

Actual production of the new type of refrigerator is set forth in greater detail by F. R. Marshall, Westinghouse project engineer at the Columbus plant. Although sandwich panel construction is not far enough advanced to give it a competitive advantage over conventional methods, Marshall points out, it has reached the point where the principal advantages of the method can be determined. Marshall lists them as follows:

1. The relatively simple production methods mean that tooling costs are about 20% of those for a conventionally tooled refrigerator cabinet. This makes it possible to design "limited edition" models because short-run production is economically feasible.



2. The panels are extremely light in eight, saving as much as 150 pounds r a 12-cu.-ft. upright, free-standing frigerator. Shipping costs are lower.
3. Strength-to-weight ratio of the sandich panel is excellent.
4. Thickness of the panel can be less an that of a conventional cabinet wall there are no voids in the sandwich sulation.
5. Moisture absorption and subseuent loss of thermal properties is eatly reduced, since the expanded olystyrene is relatively impervious to oisture.

Production of Alply refrigerator cabiets at Westinghouse is remarkably mple. The initial step in processing ie sandwich panel for the top-sideottom-side (wrapper), and for the ack, is to miter both longitudinal edges n a double-end tenoner. Fairly complex hapes can be cut into the panel because he adjustable circular saws can be posioned at any angle.

The next step is to make a crosswise niter with a radial arm saw at the oints at which it will be bent to form he wrapper of the cabinet. Each end of he back panel is similarly mitered.

Inside and outside holes for mounting rim and accessories are then drilled with a hand held air drill. Hole location and size are determined by a hinged, counterbalanced jig made of aluminum tooling plate. Inside channels for refrigerant tubes and wiring are cut with a hand held electric router and a hinged counterbalanced template.

With all mitering, drilling, and routing completed, the wrapper is folded at crosswise miters on bending fixtures to form top-side-bottom-side of the cabinet—which, along with the back and partition members, is placed in a jib and polyurethane foam is applied to mitered joints. Extruded plastic corner moulding is used to cover all inside corner joints, and extruded aluminum frame pieces are then attached to the front face of the cabinet.

Remaining assembly is similar to that performed on conventional refrigerators, with the exception that the insulation and food compartment are integral parts of the cabinet. After the compressor, cabinet accessories, and doors are installed, a protective strippable coating is removed and the cabinet is given a final inspection. The refrigerator is then packed for shipment.

From the standpoint of refrigerator production, Alply has its limitations, according to Marshall. Although the simple, straight-line fabrication cycle holds direct labor to a minimum, and though the absence of rolled edges, embosses and weldments keeps tooling cost very low, these benefits are offset somewhat by the cost of the material and the need for roll formed sections and aluminum extrusions to give the cabinet a finished look and provide mountings for hinges and working parts.

Lack of dimensional uniformity can also pose problems, according to Marshall. Thickness is specially critical in the wrapper panel, for the exterior, rather than interior, dimensions are held

Insulation ("U" Value) Properties of Two Types of Alply Panels

Panel Thickness	Insulation ("U") Value .032" aluminum both sides	.032" Al. one side, ¼" plywood other side
1 in.	.218	.248
2 in.	.116	.124
3 in.	.079	.083
4 in.	.060	.062
5 in.	.049	.050
6 in.	.041	.042

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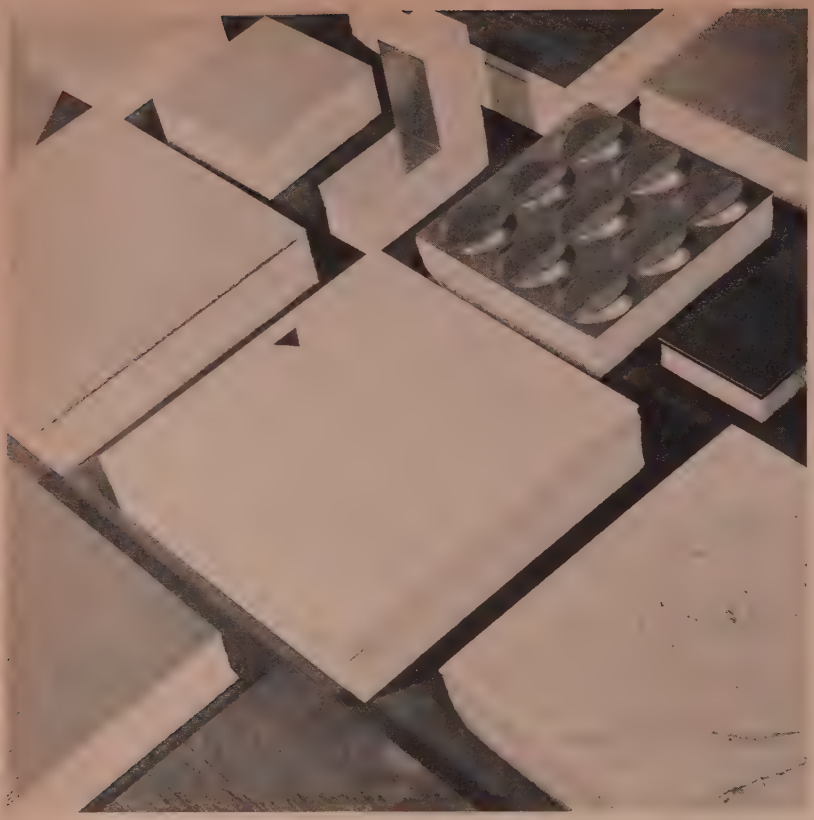


■ *Alcoa may offer Alply with a variety of facing materials in addition to aluminum. Possibilities include plywood with fine wood veneer finish, hardboard, asbestos board, sheetrock, etc. Aluminum facings will be available in a broad selection of finishes, colors and textures.*

to precise tolerances. Therefore, any variation in panel thickness is reflected in interior dimensions. It could make mating of parts difficult and add considerably to the assembly cost, Marshall explained.

He noted that door sag and cabinet deflection problems are about the same as in conventional steel cabinets, but pointed out that the two Alply models presently in production are equal in ruggedness to steel cabinets.

Permits Small Runs

"Although the sandwich panel refrigerator cabinet cannot now be produced in volume as economically as the conventional steel cabinet, its obvious advantage for low production quantities cannot be overlooked," Marshall emphasized. "The high cost of tooling for the steel cabinet places a definite limitation upon the introduction of radically new types of refrigerators and freezers. For this reason, refrigerator design changes have been evolutionary — not revolutionary."

"However, now that sandwich panel material is available, all this may be shortly changed as this type of cabinet construction offers the only low cost opportunity to probe the market with new and radically different types of refrigerators. In addition, this material makes it economically practical to build the specialty, low production quantity models needed to fill out a complete line of refrigerators."

The Alply material presently used by Westinghouse is 3 inches thick. The exterior aluminum skin is .032-inch thick No. 33 Alumilite pattern, embossed with the Alcoa E-36 pattern. Interior skin is .025-inch thick 5005 alloy, embossed with Alcoa's E-16 (pinseal) pattern. Both sides are anodized. The interior is colored gold; outside is natural.

Alcoa maintains that a 3-inch thick Alply panel measuring 4 by 8 feet and faced with .025-inch aluminum facings can support a distributed load of 1500 pounds over an 8-ft. clear span without deflecting. The panel, incidentally, would weigh only 39 pounds. A similar panel measuring 6 inches thick would weigh around 55 pounds and would support a 3000 pound distributed load over an 8-ft. clear span without deflecting.

The strength of such panels could be increased by incorporating wood or aluminum rails in the panels' edges. Strength can also be increased by varying the density of the foam. The denser the foam, the greater the strength.

The Alply material used by Westinghouse has been produced by batch methods, but Alcoa is building a machine that will turn out Alply on a continuous basis. Design details have not been disclosed, but the machine will probably feed in the facing materials and simultaneously foam the plastic core material in place. Interior faces of the skins will have been coated with a special rubber-base adhesive — reportedly the secret that makes Alply work. The adhesive remains flexible enough to stick tight despite any disproportionate expansion and contraction of the core and facing materials.

The continuous machine will be capable of producing Alply measuring from 1 to 4 inches thick, up to 4 feet wide, and lengths limited only by transportation and handling facilities. Alcoa has not as yet released a price schedule on Alply, but indications are that 3-inch thick material coated on both sides with aluminum sheet should be tagged at around a dollar per square foot.

Priced in this range, Alply will be competitive in cost with a number of materials and methods of construction, especially in the building field. Particularly promising possibilities include wall panels for prefabricated homes and mobile homes, and curtain walls for commercial, industrial and institutional buildings. In such applications, the total wall would be incorporated in one prefabricated structure.

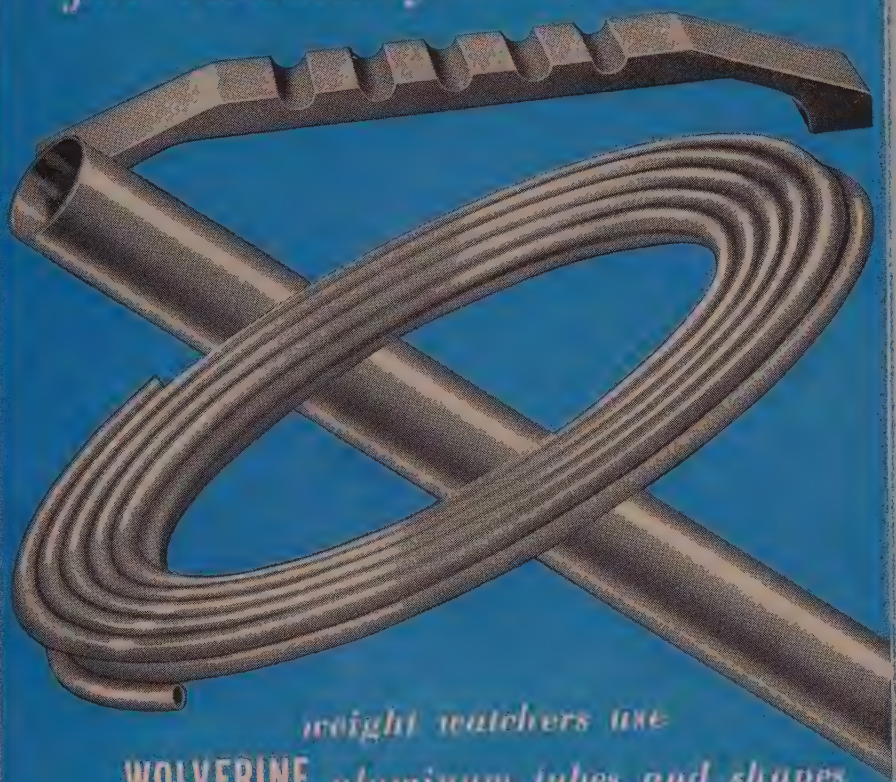
All Types of Facings

With this in mind, Alcoa is prepared to supply Alply not only with aluminum facings, but also with other types of skin, including plywood, asbestos board, hardboard, and the like. Thus, an Alply panel for, say, a prefabricated home would incorporate the exterior siding, the structural element, insulation, and interior wall surface. It would eliminate conventional framing, sheathing, siding, plastering, painting, and even decorating.

Many firms, including manufacturers of prefabricated homes, are actively investigating the possible use of Alply, an Alcoa spokesman confided late last month. An application that shows immediate promise for all types of homes, as well as other forms of building construction, is in exterior doors. A door made of Alply can be competitive in cost with conventional doors, yet superior in strength, durability, insulation value, and appearance.

Although building and construction applications seem to offer the most promise at present, Alcoa believes a good market potential for its new material exists in such fields as highway trucks and trailers, mobile homes, boats and ships — and, of course, major appliances like the Westinghouse refrigerators.

HOW ABOUT THIS
for versatility in aluminum



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HIGH VOLUME MOLTEN METAL HOLDING

Seventy-five Lindberg melting and holding furnaces having a total holding capacity of more than 700,000 pounds of hot metal are the key to Ford's volume production of die and permanent mold cast engine and transmission parts.

AT FORD Motor Co.'s huge die and permanent mold casting plant in Sheffield, Ala., a highly efficient holding furnace installation is a key factor in the volume production of Ford engine and automatic transmission parts from aluminum that is purchased and delivered in the molten state direct from the Reynolds Metals Co. Listerhill reduction plant.

Seventy-five Lindberg furnaces handle this large-scale holding assignment. Some of them receive the hot metal from the large flat-bed ladle delivery trucks and hold it for distribution to the die casting and permanent molding stations. Remelting of scrap is a smaller but no less important operation.

When the Listerhill reduction cells are tapped, metal temperature is approximately 1700° F. Normal temperature of the metal as received at the Ford plant is about 1500-1600° F.

Hot Metal Storage

The hot metal transport trucks drive directly into the Ford plant area adjacent to the 14 Lindberg reverberatory holding furnaces. Eight furnaces, each with a capacity of 65,000 lbs. of molten metal, are used for hot metal storage. The remaining six reverbs, each with a 20,000 lb. capacity, are used for remelting and/or holding operations.

One of the 20,000 lb. remelt furnaces has a dry hearth feature which is used for reclaiming aluminum from scra castings such as pistons, containing ste inserts. The charge is placed direct on the dry hearth and, as the heat applied, the aluminum is melted fro the steel portions and drains into th holding chamber. The steel inserts a then easily raked out of the furnace regular intervals.

A 15-ton bridge crane services the e tire 14-furnace holding line. When hot metal transport truck arrives, carr ing its two 6000-lb. capacity ladles, eac filled with 5000 pounds of metal, th crane is positioned over the truck an successively removes the ladle cove hoists the ladle from the truck, an positions it at the charging door of furnace.

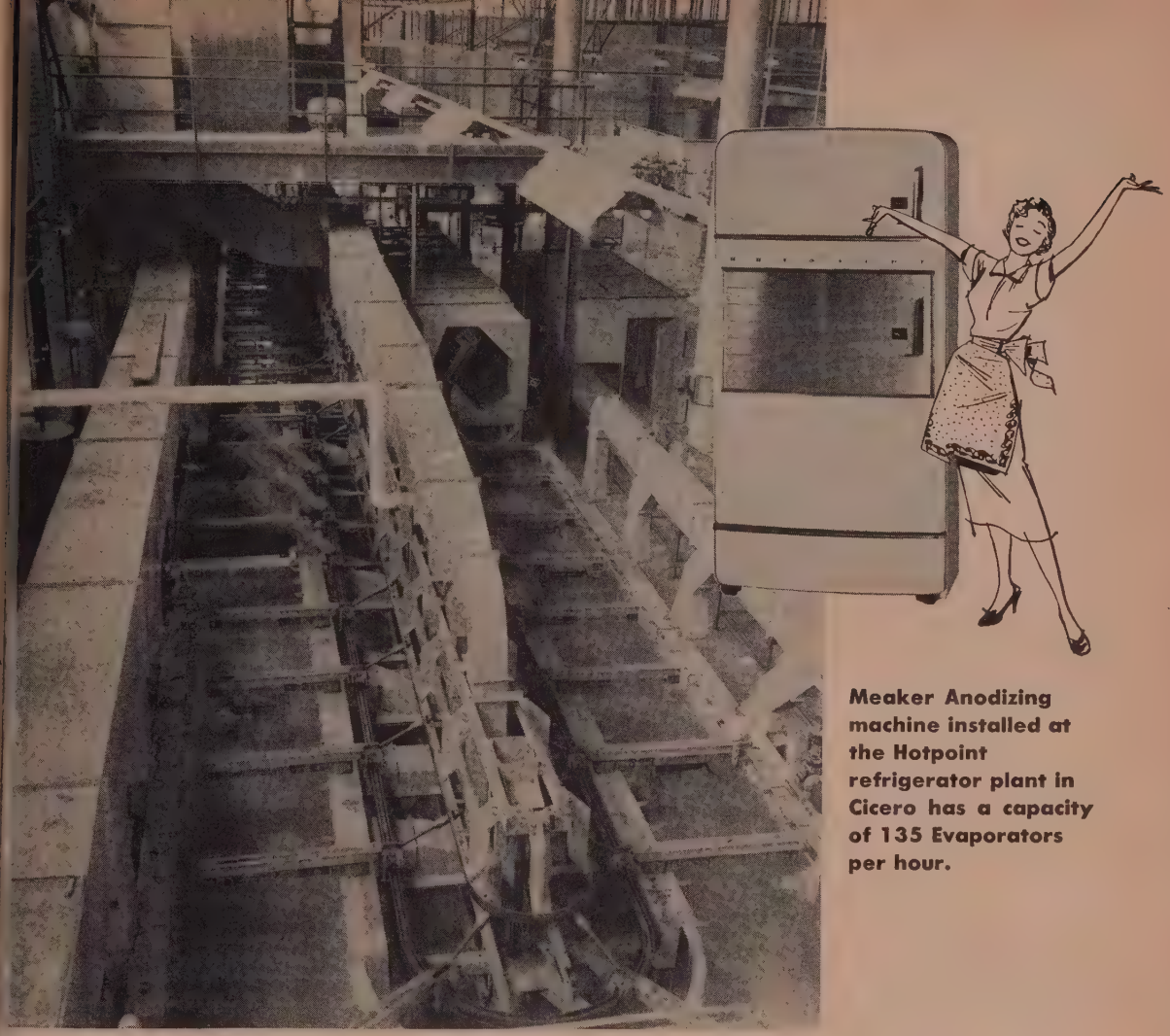
The ladle is equipped with a tru nion shaft spanning the pouring spou This shaft is locked into a pair of V grooves positioned at the charging doo which converts the ladle into a nos pouring unit thereby preventing spillag and assuring a smooth, steady, easi controlled flow of metal into the fu nace. Control of the crane hoist accomplished by pendant electrical co trols from the plant floor.

Built on Site

The big reverbs were built on site t Ford's specifications. During the la five years Lindberg's Industrial Divisio has built about 60 of these furnace with holding capacities varying up t 65,000 pounds.

Safety of operating personnel an quality of the metal have been give due consideration in the design of thes furnaces. They are equipped with dua gas-oil burners (the Sheffield area served with gas on an interruptibl contract basis) and have instruments fo

■ *Some of the 14 large, fuel fired aluminum reverberatory melting and holding furnaces installed by Lindberg Industrial Division at Ford Motor Co.'s Sheffield, Ala. casting plant. Eight of them have bath capacities of 65,000 pounds each, while six are rated at 20,000 pounds.*



Meaker Anodizing machine installed at the Hotpoint refrigerator plant in Cicero has a capacity of 135 Evaporators per hour.

MEAKER helps HOTPOINT meet new trend toward lighter Anodized Metals

Engineered and designed as an integral part of Hotpoint's production line, **this Meaker Anodizing machine is used for the complete anodizing process.** It was expressly developed to handle various components and difficult to drain refrigerator parts such as deep, box-like "evaporators." Carrier arms in this case were engineered to raise to a 30° angle assuring complete pour-out of liquid and eliminating the carryover of fluids from one tank to another.

Meaker engineers think like plant engineers and it's this kind of detailed thinking that has helped Hotpoint solve many other plating problems and produce a finer end product at the lowest possible cost. On your next metal finishing problem, call Meaker—**this experienced company can show you tomorrow's ideas for plating and processing.**

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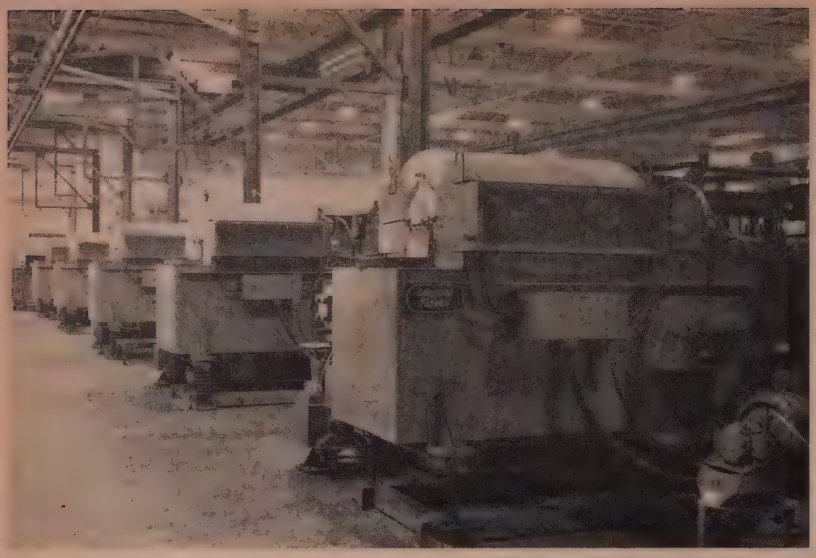


■ *Battery of 43 electric resistance aluminum holding furnaces for die casting. Twenty of them at the Ford plant are equipped with Lindberg's Autoladle for automatic delivery of measured shots to die casting machines.*

precise metal temperature control as well as flame failure protection.

The metal is protected against solidification or overheating by a recording controller which sets off an alarm when the bath temperature drops below or rises above a preset level. The alarm also goes off if the main gas valve closes. Other controls cause the combustion chamber to be time purged prior to relighting after a shutdown so that the burners can't be operated without suitable fuel and/or combustion air pressures.

Control and recording instruments were designed and installed by Industrial Division, Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

Another important feature of the Lindberg reverberatory holding furnaces are water cooled doors and door frames which prevent warping through temperature inequalities.

Effective Heat Seal

"Cool framing and cool doors maintain a proper heat seal," a Lindberg engineer explained. "This helps extend the life of the furnace. It's more comfortable for the operator, too."

Alloying to various SAE analyses is performed by Ford at the reverberatory furnaces. The auto maker insures consistently high quality of its foundry products by adhering to rigid control procedures. For instance, the careful pouring technique used in charging the holding furnace minimizes dross formation.

Before metal from a particular holding furnace can be released to the casting area, it is subjected to a refining treatment using chlorine gas. After the molten bath is thoroughly fluxed and skimmed, it remains undisturbed for a fixed period of time.

During this period the charge is selectively sampled. Inspection of the sample will then determine whether this charge can be delivered to the casting areas. No metal is released without being approved and recorded.

Fluxing Procedure

The molten metal is dispensed from the Lindberg reverberatory furnaces through tap-out blocks into a cab-mounted 2000-lb. capacity transfer ladle suspended on a monorail. When the ladle is filled, a two-pound solid flux (degasser) tablet is immediately placed in the ladle and held submerged in the bath by an inverted steel bell. After this fluxing procedure another sample is taken from the transfer ladle and tested. The sample must again prove the quality of this batch before the ladle can be moved to the casting area.

All casting stations are served by Lindberg-Fisher electric resistance reverberatory holding furnaces of either 1500 or 2000 lb. capacity. To make certain that quality of the molten aluminum has been maintained to this point, samples are taken from each holding furnace once a day. The test procedure is identical to that previously used. Should a sample indicate porosity resulting from the charging operation of one of these furnaces, the charge is subjected to a fluxing treatment using dry bottled nitrogen. Metal is not used from this furnace until the sample is again approved.

Twenty of the 2000-lb. furnaces are used in conjunction with 800-ton die casting machines. Each furnace is equipped with a Lindberg-Fisher Autoladle, which automatically dispenses a measured shot of aluminum into the well of the die casting machine.

The Autoladle operates on the principle of a pressurized chamber, with the size of the shot depending on the amount of pressure and the time of its application. It is adaptable to electric furnaces or fuel-fired reverbs. The Autoladle can be quickly adjusted to repetitively deliver any size shot up to the 30 pounds, within an accuracy of plus or minus one ounce. Ladled metal is withdrawn from below the surface of the bath.

Metal for Pistons

Eighteen Lindberg 1500-lb. capacity furnaces are stationed in the permanent mold piston casting area. Arranged for hand ladling, each unit is positioned to serve two automatic permanent mold machines built by Permanent Mold Die Co., Warren, Mich. These furnaces are equipped with screw-jacks to permit adjustment of furnace height for maximum operator comfort during hand ladling.

The operator fills the mold using a twin-spout hand ladle. The machine opens automatically, lifts the piston casting from the mold cavity, delivers it to a slide conveyor rack, repositions new steel inserts on the core, closes, and is ready for another pour.

One operator delivers metal to both automatic permanent mold machines. The piston castings move from slide racks adjacent to each machine to a return conveyor located under the rear charging well of the furnaces. From here they are transported to one end of the casting line to an automatic trimming machine.

The remaining 22 Lindberg-Fisher electric holding furnaces (1500 lb. size) are identical to the ones used in the permanent mold line (for complete interchangeability of furnaces throughout the casting area), and are used in conjunction with 400 and 600 ton die casting machines to produce a large variety of automotive parts. Careful arrangement of furnaces and die casting machines is followed here, as throughout the plant, to achieve the utmost efficiency in moving various alloys to the proper casting stations.

In a concentration such as this, where many furnaces are in almost constant operation under one roof, the electric resistance type is most desirable. Not only is the power cost lower (nearby Muscle Shoals is the source), but an absence of fuel exhaust makes this type of furnace much more comfortable for the operators and there is less tendency for hydrogen pick-up in the aluminum.

Lindberg-Designed

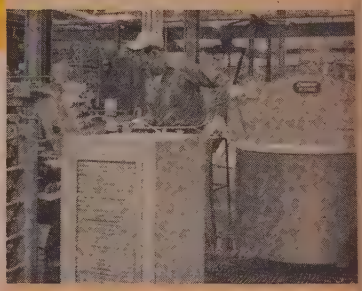
urnaces, more than 75 of them,
ıelp Ford Motor Company maintain
:asting production and quality standards

The new Aluminum Castings Plant of Ford Motor Company, Engine and Foundry Division, at Sheffield, Alabama, is a model of modern production efficiency. Contributing to its effective operation is a huge battery of Lindberg-Fisher aluminum holding furnaces, more than 75 of them. Eight large 65,000 lb. capacity reverberatory holding furnaces receive molten aluminum delivered from an adjacent Reynolds Metals plant and hold it at the desired temperature. Six other reverberatory furnaces, each with 20,000 lb. capacity, are used for remelting scrap aluminum from trimmed parts and holding metal at its usable temperatures. Molten metal is then delivered to more than 60 electric resistance holding furnaces in the casting area as needed. This unique installation, developed by Ford engineers in conjunction with Lindberg, is a major factor in maintaining the high quality product and production standards required by Ford.

Lindberg equipment and Lindberg planning can help you find the most effective answer to any problem of applying heat to industry. We cover the field, melting and holding, heat treating, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend just the type of equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2446 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.

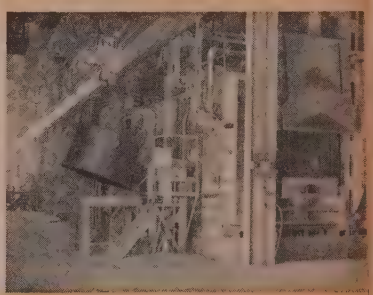
Handsome entrance to new plant of Ford Motor Company, Sheffield, Alabama.

Metal temperatures are positively controlled through Lindberg Control Panel.



Some furnaces are arranged for hand ladling and others are equipped with Lindberg Auto-ladle.

Molten aluminum is delivered direct to reverberatory holding furnaces.



The molten metal is held in these 14 huge furnaces for distribution to the casting areas.

LINDBERG heat for industry

THE WELDABLE ALUMINUM ALLOYS

history — composition — physical properties — welding methods — bending — deep drawing — welding procedures — performance of welds — testing of welds — applications.

MODERN welding techniques, plus the continuing improvement of weldable aluminum alloys with superior mechanical properties, have been important factors in the growth of aluminum as a structural material.

The aluminum-magnesium (5000) series of weldable aluminum alloys received special attention at the second annual engineering conference, held last year by the Aluminum Co. of America. The 5000 series has accelerated aluminum's use in many types of welded structures, including tank cars, truck bodies, storage tanks, cranes, elevators, and marine applications.

Four main areas of heavy construction alone are expected to boost the use of the aluminum-magnesium (Al-Mg) alloys to around 250 million pounds annually by 1961. Within this series are two new Alcoa alloys—5454 and 5456—and their corresponding welding electrode alloys, 5554 and 5556. These new materials are the result of 30 years of research and development by Alcoa.

E. H. Dix, Jr., formerly assistant director of Alcoa Research Laboratories, told an audience of 220 engineers representing about 100 manufacturing firms that the aluminum-magnesium series alloys comprise one of the oldest alloy series used commercially.

"Wrought alloys containing up to about 4% magnesium with a small amount of manganese or chromium have been used extensively in this country and abroad for a number of years," Dix said. "Alcoa produced sheet of a 4% magnesium alloy in 1921. Alcoa alloy 5056 (Mg 5.25%, Mn and Cr each 0.10%) has been used for over 20 years for wire products. A good many million pounds have been produced."

But interest in sheet and plate of the stronger alloys in the Al-Mg series lagged until inert gas shielded arc welding techniques were developed. Now the alloys are important for welded structures because they attain their strength without heat treatment and are readily weldable, giving good joint efficiency and excellent ductility.

"Maximum strength in the annealed temper is an important requirement for welded structures," Dix said. He noted that both the tensile and yield strength increase with magnesium content.

"Although elongation decreases for the first several per cent of added magnesium, thereafter there is a gradual increase (see graph at left below). It is unusual in aluminum alloys to find an element which increases both strength and elongation," he pointed out.

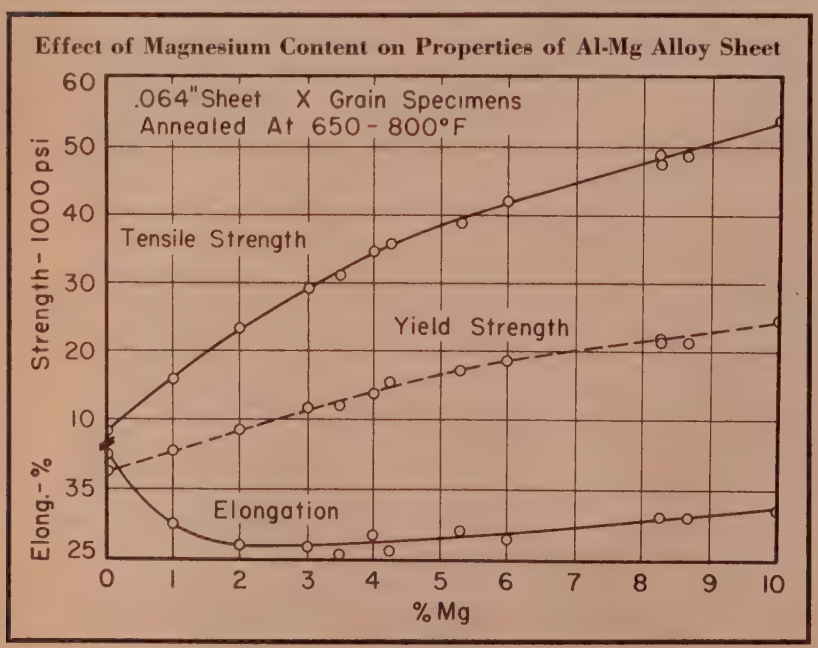
Dix reviewed nearly three decades of research aimed at determining how much of this strength could be made available for commercial use. The principal limiting factor has been susceptibility to stress corrosion cracking. Alcoa was investigating this phenomenon as long ago as the late 1920s.

"Saucepans made of sheet containing about 10% magnesium were subjected to a corrosion test by filling them with New Kensington (Pa.) tap water," he said. "After a few months, these pans began to open up much like the unfolding of rose petals. This experience started a rather intensive study of this susceptibility to stress corrosion cracking."

Intensive effort in recent years enabled Alcoa to introduce alloy 5456 for sheet, plate, and structural shapes. It has a nominal chemical composition of 5.25% magnesium, 0.8% manganese, and 0.1% chromium. In the form of plate ¼ to 1¼ inches thick and in temper —H321, it has a tensile strength of 46,000 psi; yield strength of 33,000 psi; and elongation (in two inches) of 12% (see table on page 42).

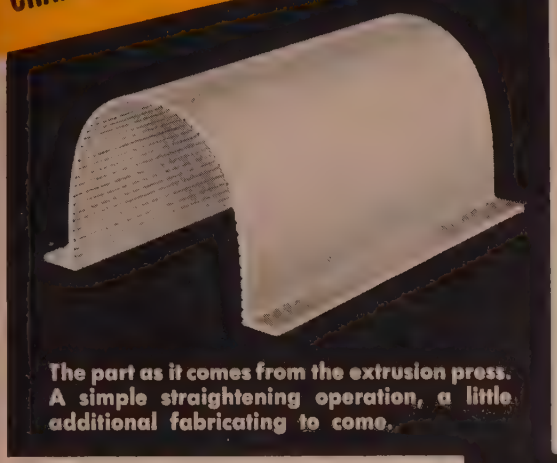
In the annealed and hot rolled —H321 tempers, alloy 5456 is immune to stress corrosion cracking under extremely severe testing conditions, according to Dix. It is recognized as the strongest nonheat-treatable alloy produced for

Effect of Magnesium Content on Properties of Al-Mg Alloy Sheet



ASSIGNMENT:

EXTRUDE A 7" WIDE x .050" THICK CHANNEL SHAPE ON A 5" CAPACITY PRESS



The part as it comes from the extrusion press. A simple straightening operation, a little additional fabricating to come.

other extruders said it couldn't be done...

GENERAL DID IT!

The manufacturer of heaters brought his problem to General Extrusions, Inc. He wanted a hearth bottom for his product — a fluted, gold-anodized aluminum extrusion. The specifications called for a 7" x .050" shape. Extruders with presses that take 8" diameter billets said it couldn't be done because of the thinness, too great a reduction ratio.

G.E.I. engineers came up with the extrusion he wanted, on a 5" press! Here's how: The shape is extruded half round, then straightened, notched and bent, holes punched. The final operation is anodizing the shape in General's Brite Generaleaf Gold Finish.

G.E.I. extrudes this shape AT REGULAR SOLID SHAPE PRICE. The costs are less than would be incurred on a bigger press. The die costs, alone, were less than half.

If you have a problem involving aluminum fabrication, finishing or extrusion, why not take it to General's ingenious staff of engineers. It costs nothing to consult with them, on one part or a million. These highly skilled technicians are pioneers in the field of designing and developing new uses for extruded aluminum. Imaginative, they often come up with results other extruders say can't be done.

The finished hearth bottom

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Minimum Tensile Properties of 5456 Alloy Plate and Extrusions

Plate

Temper	Tensile Str., psi	Yield Str., psi	% Elong. in 2 in.
—0	42,000	19,000	16
—H321	46,000	33,000	12

Ext'ns

—0	42,000	19,000	16
—H112	42,000	19,000	12
—H311	42,000	25,000	12

commercial use in this country for welded structures," he said.

The newest member of the 5000 series, alloy 5454, was developed for prolonged service at temperatures above those recommended for the higher magnesium alloys. In structural products, it is proving to be immune to continuous heating at 150°F to 300°F.

Nominal composition of alloy 5454 is 2.75% magnesium, 0.80% manganese, and 0.10% chromium. In the H32 temper in sheet or plate form it exhibits 40,000 psi tensile strength; 30,000 psi yield; and 22% elongation. Extrusions are also produced in this alloy. Experience with alloy 5454 is not sufficient to establish guaranteed properties. Typical values are shown at right.

"No stress corrosion failures have occurred in accelerated corrosion tests after heating for six months at several critical temperatures," Dix said. "Additional tests will be made after heating for one year. In the meantime, it is hoped that prospective users will start field evaluation."

Test results on welded Al-Mg alloy plate have been encouraging. Test pieces ¼ to 2 inches thick were butt (groove) welded employing 5456 filler wire and the inert gas consumable electrode method. The average strength across the welds in all thicknesses was above the guaranteed minimum tensile strength alloy 5456 in the annealed temper, and the majority of the minimum values were also above the guaranteed tensile strength of the annealed plate (see graph at right).

E. T. Wanderer, manager of Alcoa's hydraulics section, sales development division, described the range of mill products produced in the high strength, weldable alloys and discussed the latest fabrication and welding techniques. The 5000 series have found greatest use as sheet and plate, he said. However, extruded shapes, tubing, rolled rods, bars, and wire are also produced.

"The trend to wider sheet and plate has been facilitated by the installation of larger mills and the development of techniques to produce larger ingots," Wanderer said. "In the Al-Mg alloys up through 5456, widths up to 144-in. are available, depending on finished thickness and temper. These greater widths permit the use of larger one-piece heads and also reduce the amount of welding required on the shells of tanks and vessels.

In the —H24 temper, 5456 sheet is fabricated by partially annealing cold worked sheet. It can be furnished in thicknesses up to .249-in. In the —H321 temper it is furnished in thicknesses of .125-in. and greater. The —0 (annealed) temper can be supplied in both sheet and plate. All three tempers have excellent resistance to corrosion and stress corrosion when used in accordance with recommended temperature limitations.

Typical Properties of Aluminum Alloy 5454

Temper	Tensile Str., psi	Yield Str., psi	% Elong. in 2 in. or 4D
Sheet and Plate			
—0	36,000	17,000	22
—H32	40,000	30,000	10
—H34	44,000	35,000	10
—H36	49,000	40,000	8
—H112	36,000	18,000	18

Note: Maximum thickness for —H32 plate is 2"; maximum thickness for —H34 plate is 1".

Extruded Shapes and Tubes			
—0	36,000	17,000	22
—H112	36,000	18,000	18
—H311	38,000	26,000	14

Extrusions and extruded tube generally are offered in these alloys in the —0 and —H112 tempers, with —H311 temper available in alloys 5454 and 5456. The 14,000 ton press at Alcoa's Lafayette (Ind.) works can produce larger extrusions.

Weight limit per piece is around 2500 pounds, with a weight per foot of 22.7 pounds. Maximum cross section is 19 square inches, and maximum circumscribing circle is 23 inches. For tube or pipe, maximum I.D. is 19½ inches, permitting production of 20-inch pipe in some alloys. No large pipe has been produced in the 5000 series.

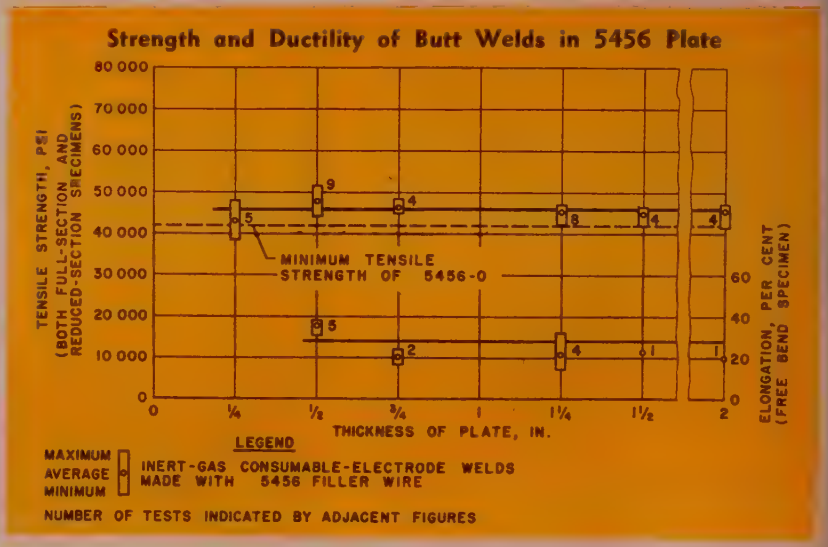
Mechanical Characteristics

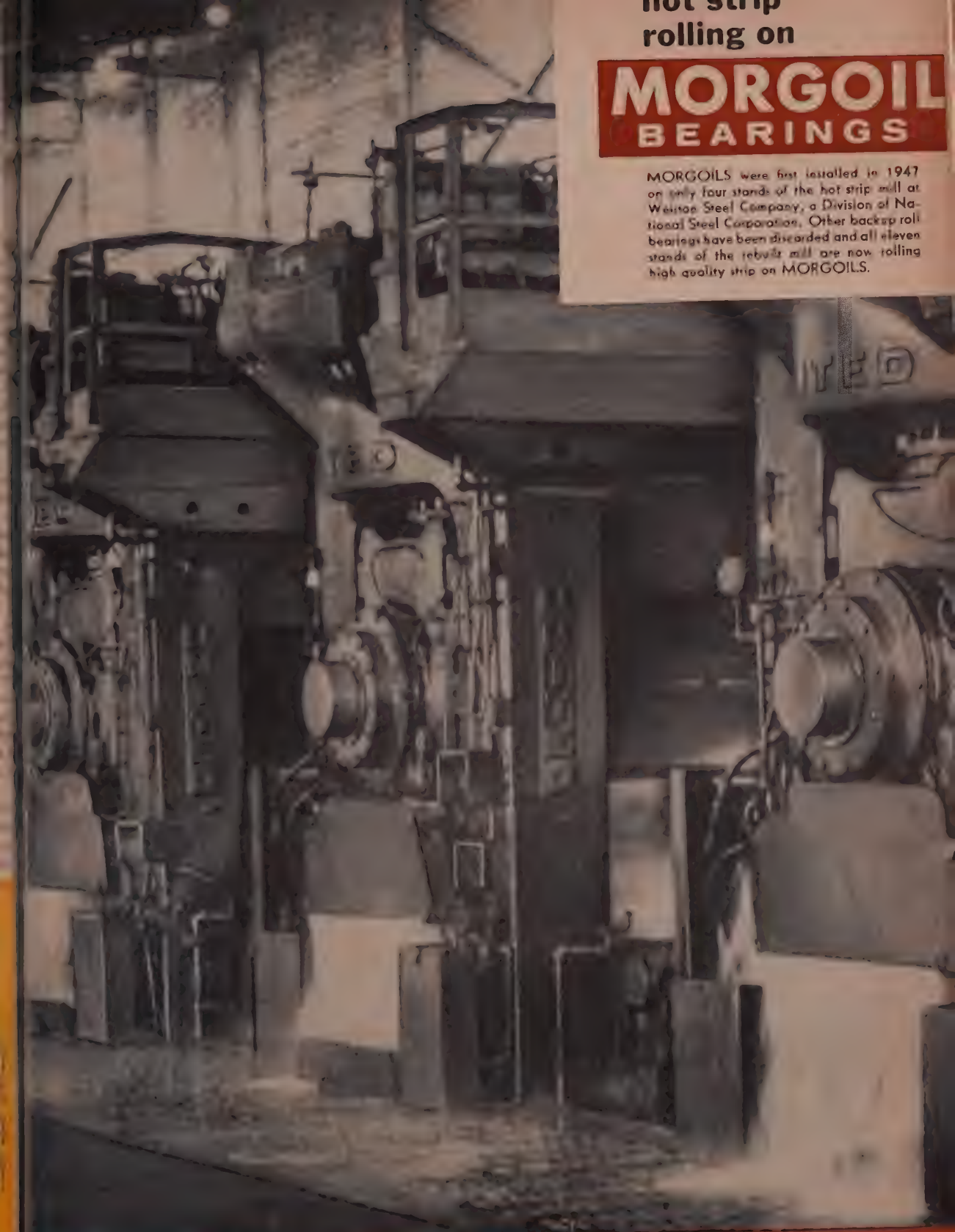
"In determining allowable stresses, the mechanical characteristics of the material must be known," Wanderer pointed out. "These include tensile properties of welds and parent material, fatigue characteristics, and creep and stress rupture data. Alloy 5456 is similar to other aluminum alloys in that the tensile properties do not decrease at down to —320°F. Usually, they increase at low temperature. This points up the suitability of aluminum alloys for cryogenic (ultra low temperature) service."

Creep and stress rupture often control the design stresses for Al-Mg alloys at elevated temperatures. This is of concern only for alloy 5454 and others having lower magnesium contents, since elevated temperature service is not recommended for alloys having higher-magnesium contents.

In general, permissible bending radius for the 5000 series is approximately an inverse function of their strength. However, the radius around which 90° bending can be accomplished is practically the same for the annealed tempers of alloys 5154 through 5456. Specifically, for ⅛-in. sheet, the radius is 0-1t; for ¼-in., it is ½-1t; for ⅜-in., it is 1-1½t; and for ½-in., it is 1-2t.

For alloy 5456-0, a thickness of 1-in. requires a radius of 2-3T. Alloy 5456-H321 requires a 3 to 4T radius for 1-in. material, and correspondingly smaller





hot strip rolling on

MORGOIL BEARINGS

MORGOILS were first installed in 1947 on only four stands of the hot strip mill at Weirton Steel Company, a Division of National Steel Corporation. Other backup roll bearings have been discarded and all eleven stands of the rebuilt mill are now rolling high quality strip on MORGOILS.

ORGAN CONSTRUCTION CO., WORCESTER, MASSACHUSET

ROLLING MILLS • MORGOIL BEARINGS • GAS PRODUCERS
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radii for thinner gauge material.

"These figures are based on mechanical considerations alone," Wanderer said. "Tooling will have an effect on the radius. . . . Bending of 5456 in the —0 or hot rolled tempers can often be accomplished on the minimum radius permissible from a mechanical standpoint without seriously changing susceptibility to stress corrosion cracking. For example 1¼-inch thick 5456-H321 performed satisfactorily after being bent on a 2.5T radius."

Drawing Characteristics

Prior to commercial use of the new alloys, experimental work determined their relative drawing characteristics. Four different drawn items were attempted with reductions on the first draw of 43.5%, 40%, 38%, and 28.5%. Gages were .064, .081, .102, and .188. In all cases, the —0 temper was employed. Subsequent reductions also varied. The following conclusions were drawn:

Listed in order of decreased drawability, the alloys are 5454-0, 5086-0 and 5456-0. Alloys 5454-0 and 5086-0 have relatively good potentialities for drawing applications, while 5456-0 has only limited possibilities.

It appears that increasing the draw ring radius on the tools and decreasing the amount of reduction per draw are desirable when drawing the high strength alloys. Intermediate anneals are also helpful.

Other tests have been carried out on the forming of 2 to 1 ellipsoidal heads of the high strength Al-Mg and Al-Mg-Mn groups. The results showed that 5456-0 required preheating, a larger die ring radius, and greater tool clearance than did the other alloys. The 3T ring radius is greater than the 2T radius normally used on lower strength alloys.

The conclusion—that the drawing of heads becomes more critical as strength increases—confirms the earlier drawing tests which indicated superior drawability of 5454 and 5086 alloys. However, even 5456 can be satisfactorily drawn by the use of proper techniques.

■ ***U.S.S. Ranger is equipped with this aluminum elevator, largest all-welded aluminum structure in the U. S. Aluminum plate in alloys 5154 and 5356, up to two inches thick, were used to make the inboard supporting member shown here.***

How To Weld Them

Inert gas welding, arc cutting and resistance welding can be used on these alloys almost as readily as on low carbon steel.

Arc welding is a popular method for joining these alloys. Two arc welding processes are used. Both employ inert gas; one uses a consumable electrode; the other uses a tungsten electrode. Such processes as metal arc with flux-coated electrodes, or carbon arc are not applied to these alloys.

Gas welding, though still used on some of the lower strength alloys, is not suitable for these alloys because of the difficulty in controlling cracking during welding.

All of these alloys are suitable for resistance welding including spot, seam and flash welding. Welds can be made to meet aircraft, as well as commercial standards.

These alloys are suitable for cutting with the new arc cutting processes. Quality cuts at high speed are being produced daily in the fabrication of these alloys.

In general, when alloys 5052, 5083, 5086 and 5154 are welded to themselves or to each other the suggested filler alloy, from a structural point of view, is 5356. Where temperatures over 150°F are involved 5052 filler should be used for welding 5052. Filler alloy 5554 is suggested for welding 5454 to itself or to alloys having magnesium contents lower than that of 5454. For welding 5454 to 5083 or 5086, filler alloy 5356 is suggested.

For alloy 5456, welded to itself or to any of the other alloys, alloy 5556 is recommended. Where specific corrosion resisting characteristics, or color match for anodizing is required, other filler alloys may be indicated.

The inert gas arc welding characteristics of these alloys are similar to those of other weldable aluminum alloys. But there is a tendency for alloys containing more magnesium to exhibit less fluidity in welding than experienced with 4043 filler. Therefore, a slightly different technique is required.

As magnesium content increases, shrinkage cracks are less prone to occur. Nevertheless, the operator must be careful to control cracks in weld craters, which tend to occur whenever the arc is terminated.

■ ***Alloy 5454 was used in the construction of the largest aluminum dump truck in the world, shown here on display at the Chicago Auto Show. It has a capacity of 37½ cubic yards and weighs 27 tons. Its wheels are more than five feet high.***

Proper operator technique is required in both welding processes to eliminate oxide inclusions in the weld metal, undercutting, and gas porosity. Correct arc length, together with straight rather than weaving passes, contributes to good weld quality.

Adequate preparation and correct welding conditions are other prerequisites. The former includes proper edge preparation, thorough cleaning of filler wire and work, and organization of the job so that no undue delay occurs during welding. Organization will minimize the number of times the arc is started and stopped during welding.

Correct welding conditions include proper machine settings for voltage and current, and correct electrode size which is dependent upon the thickness of the material being welded. Gas flow must be properly controlled also, with more gas usually being used with larger electrodes.

Either helium, argon, or a mixture of both is suitable for consumable or tungsten electrode welding. One hundred per cent argon or 65% helium and 35% argon is occasionally used, especially where the joint is sensitive to cracking. Penetration tends to be deeper when helium is added.

Performance of Welds

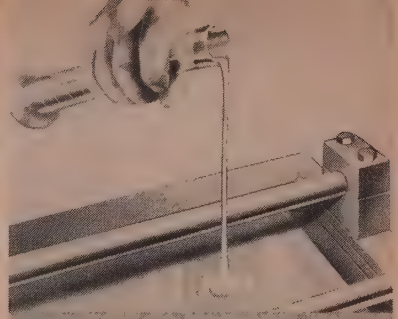
Alloy development has resulted in stronger welds with good ductility. Today, 5456 alloy provides joint strengths equal to three times those provided by alloy 3003 several years ago; with comparable ductility. The properties of 5454 alloy welded joints are very similar to those of 5154.

Suggested guided bend radii are 2T for 5052, 5154, and 5086 and 3 1/3T for 5083 and 5456, using standard ⅜"

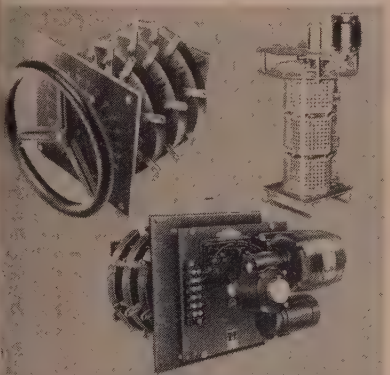
(Continued on page 48)

SILICON, GERMANIUM AND SELENIUM RECTIFIERS

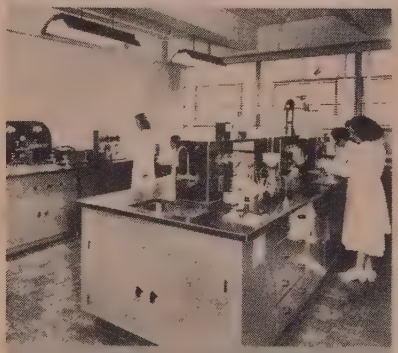
PROCESSING EQUIPMENT



CLEANERS AND CHEMICALS



CONTROLS



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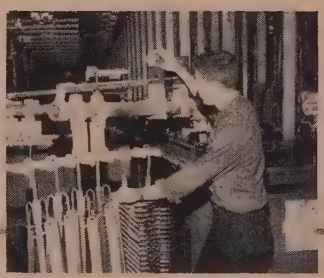

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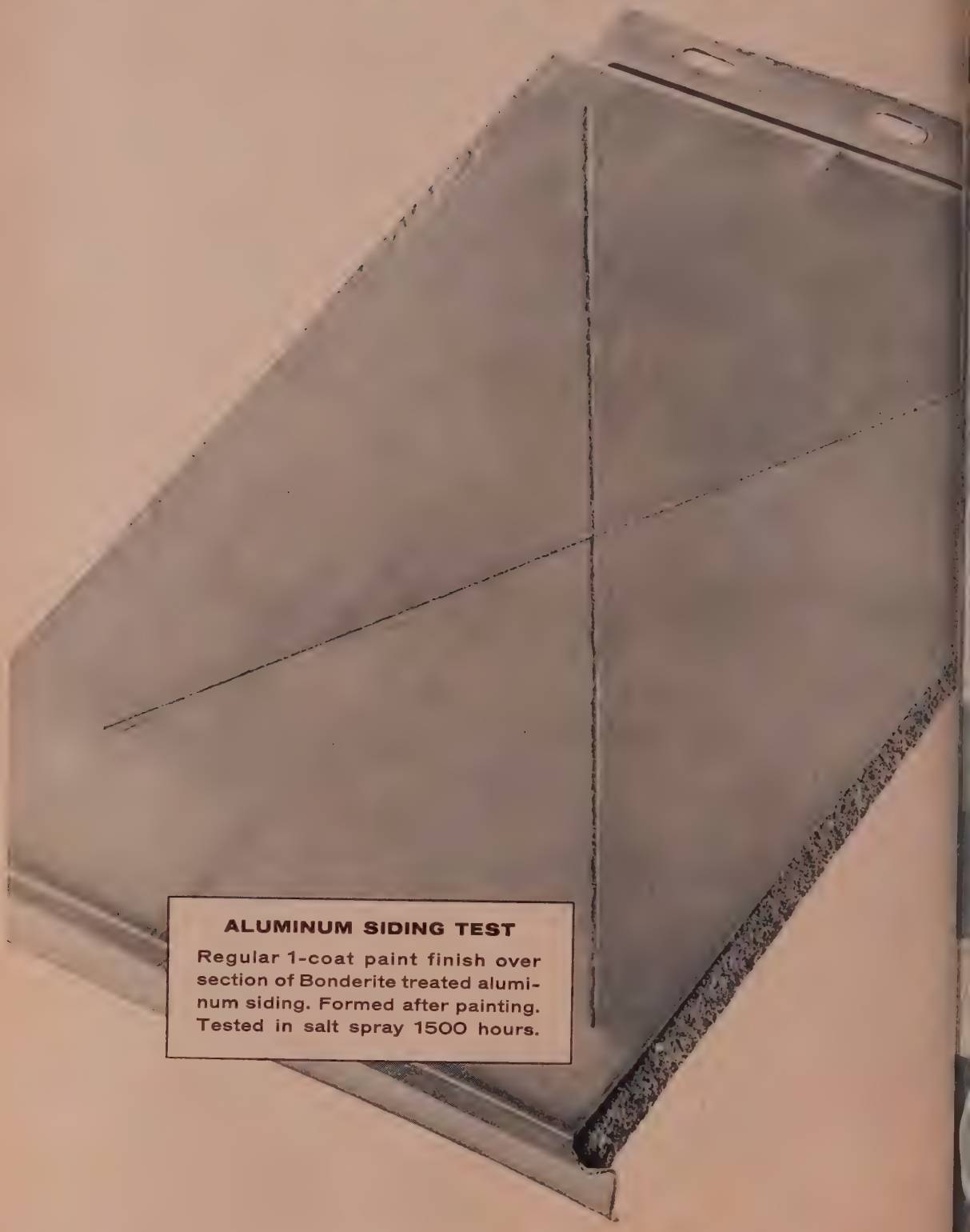
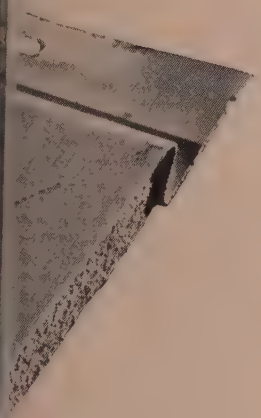


ALUMINUM SIDING TEST

Regular 1-coat paint finish over section of Bonderite treated aluminum siding. Formed after painting. Tested in salt spray 1500 hours.

or ALUMINUM

tter paint adhesion...better corrosion control



In two hundred plants—many of them the leaders in their particular fields of aluminum fabrication—Bonderite for aluminum is being used today!

Bonderite makes it possible to take aluminum in the coil, run it through a continuous line in which the strip is cleaned, Bonderized, roll-coat painted, dried—and then recoiled.

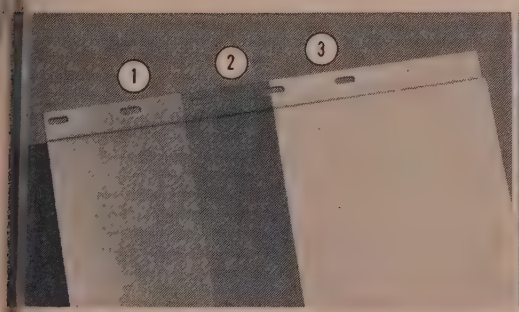
Because Bonderite gives paint such a secure foothold, it will stand severe forming operations (see photo below). With the Bonderite corrosion barrier at work, durability of the paint finish is almost indefinitely prolonged.

Bonderite meets and exceeds the requirements of Government Specification MIL-C-5541. Bare corrosion resistance is outstanding.

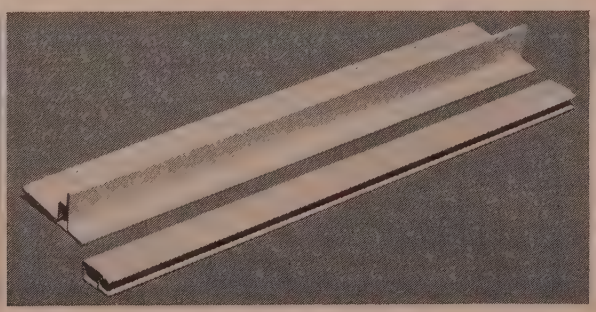
There's more than one type of Bonderite for aluminum. Besides the paint base, there's a Bonderite that creates a pleasant green coating, for use on architectural products. There's a Bonderite which protects without changing the characteristic color of the aluminum. Another Bonderite coats aluminum, steel and zinc—just the thing for mixed production.

There is a Bonderite, in fact, for every form of aluminum production, and for practically every alloy.

The big news in surface treatment for aluminum today is Bonderite! Let a Parker man tell you all about it!



Here's the 1-2-3 for durability of painted aluminum. Section of siding shows bare aluminum, (1); Bonderite treated, (2); and roll-coated paint, (3).



These aluminum window and screen frame sections were Bonderized and painted in the strip and formed after painting. There isn't a break in the finish anywhere!

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■ *Mississippi River Chemical Co. uses this 2⅓ million-gallon-capacity welded aluminum storage tank for holding ammonium nitrate. Sidewalls of the structure are alloy 5052.*

thick specimens prescribed for bend tests.

The strength of welds in fatigue loading is increasingly important with the increasing use of welded vessels for critical service. For low numbers of cycles fatigue strength of the welds is generally proportional to static strength. However, as the number of cycles increases, the difference between the alloys becomes less significant; all fall within a reasonably narrow band for cycles over one million.

For most structural applications of these alloys some advantage can be taken of the increased fatigue strength of the high strength aluminum alloys.

A part of the "torture chamber procedure" applied to alloys before they are released for general use includes the construction of test vessels which are loaded hydrostatically to failure. But even though welded test plates meet tensile requirements, it is not necessarily true that a vessel made of the same alloy using similar techniques will meet requirements.

Wanderer summarized his presentation by re-affirming the excellent weldability and strength of the Al-Mg alloys in the welded condition.

Good Sub-Zero Strength

"They follow the general trend of aluminum alloys in their suitability for low temperature applications as demonstrated by mechanical properties that are as good as or better at low temperatures than they are at room temperatures," he said. "The static tensile properties, fatigue properties, and creep and stress rupture properties tend to increase with increasing magnesium content, except that the proportionate increase in creep and stress rupture of these alloys at elevated temperatures is less.

"Fabricating characteristics including bending, forming, and drawing are inversely proportional to magnesium content; that is, the higher magnesium alloys exhibit less formability. Corrosion resistance of all these alloys is good when they are used in accordance with recommended temperature limitations.

. . . And the Potential?

The degree to which the 5000 series has boosted aluminum's potential in practically all major industries was cited by W. S. McChesney, manager of Alcoa's industry sales. The process industries represent one of the fastest growing markets, he said.

"By 1961, the chemical, petrochemical, petroleum, food, drug, rubber and synthetic textile industries promise to triple their aluminum usage, which now stands at about 4% of production," McChesney said.

"Over the next four years, the planned expenditure for expansion in these fields amounts to 49% of the total scheduled for all manufacturing industries. Greatest growth will be in the manufacture of plastics and synthetic fibers, and in industries requiring low temperature processing," he reported.

Aluminum retains its mechanical properties at low temperatures. This, plus the fact that it has good corrosion resistance and low first cost, makes it especially attractive to designers of processing equipment.

Other rapidly expanding applications include:

Missile fuel tankage, which should consume 75 million pounds of aluminum by 1961.

Tonnage oxygen plants, liquid methane transportation units, and equipment to separate hydrogen isotopes will probably use 60 million pounds over the next four years.

Surface condensers, condensate storage systems, boiler lagging, architectural items and other non-electrical uses in power plants represent an aluminum market of 50 million pounds a year.

During the next ten years, 80 million pounds of aluminum piping and structural forms may well be used in Lake Maracaibo, Venezuela, petroleum operations.

Water handling equipment, such as heaters and softeners, will require 100 million pounds a year by 1961.

The Big Applications

J. R. Willard, manager of Alcoa's sales development division, gave the engineers an industry-by-industry illustration of how the Al-Mg alloys are used in equipment and heavy duty structures.

Discussing chemical industry applications, Willard said that there has been an increasing demand for very large storage tanks for corrosive chemicals. He cited a tank built by Chicago Bridge & Iron Co. for Mississippi River Chemical Co., Selma, Mo. The 128-ft. diameter by 26-ft. high tank (illustrated) has a capacity of 2-1/3 million gallons of 83% ammonium nitrate stored at a temperature of 180°F.

"A sidewall of this tank employs alloy 5052 ranging up to 1⅞ inches thick." Willard said. "The top and bottom are alloy 3003. Alloy 5052 was selected because of the operating temperature. If a tank of this size were to be constructed today, alloy 5454 would be the most economical selection and would permit a design stress about 18% higher than is available in alloy 5052."

In pointing out that aluminum alloys improve in tensile and yield strength without embrittlement as temperatures go down, Willard mentioned cryogenic applications as ideal for aluminum alloys of the 5000 series. Aluminum equipment is used to handle liquefied gases such as methane, ethane, hydrogen, oxygen, nitrogen, helium, and others.

He believes that the high properties of aluminum at low temperatures coupled with aluminum's low price compared to other acceptable alternative materials, will stimulate a great increase in the use of aluminum equipment for handling of liquids and gases at low temperatures, the tonnage manufacture of liquid oxygen, the transport of liquid methane, the fractional distillation of hydrogen isotopes, and the low temperature separation of hydrocarbons.

A tonnage oxygen plant designed and built by Linde uses alloys 5154, 5086,

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and 5456. These plants are incorporated in steel mills to provide enriched air for pyrometallurgical purposes. Similar plants are used in the preparation of synthetic organic chemicals.

In the handling of chemical fuels for missiles, etc. there is need for tankage on the missiles as well as transportation equipment for oxygen, 90% hydrogen peroxide, and red fuming nitric acid. These chemicals are normally handled in aluminum tank trailers or tank cars.

Because of the tendency of hydrogen peroxide to break down into water and oxygen, the normal practice is to select 5000 series alloys which have special controls on copper and manganese contents. Instead of alloys 5154 and 5052, their high purity counterparts, 5254 and 5652, normally are selected.

General American Transportation Corp. manufactures aluminum tank cars, using alloys 5154, 5254, 5052, 5652, and the heat treatable alloy 6061. The cars handle a variety of chemicals including hydrogen peroxide, ammonium nitrate, acetic acid, nylon salts, and others. The selection of aluminum is based on its high resistance to corrosion, easy workability, freedom from unwanted color, and low cost compared to stainless steel.

In Power Plants for . . .

"It is becoming common practice in modern power plants and atomic energy installations to store high purity water and condensate in aluminum storage tanks and distribute them in aluminum pipe," Willard continued.

"The advantages of aluminum are freedom from maintenance and substantial reduction in iron contamination of the boilers since no iron is introduced by the aluminum condensate storage tanks," Willard said. "For atomic energy applications, the low cross section and short half life are advantageous."

Willard also mentioned condensate storage tanks used by public utility companies (they use alloy 5086 in accordance with API Standard 12G for aluminum alloy storage tanks), and vacuum deaerators—towers built with 5154 alloy sheet — as further applications of the high strength, weldable alloys in the power industry.

Extra Profit in Trailers

Highway tank trailers made of alloy 5454 carry hot fluids. Trailers built by Butler Mfg. Co. haul hot asphalt from a batch plant to a mixing station. The asphalt is loaded at anywhere from 250° to 400°F, and may be carried as far as 400 miles. Fiberglas insulation is used on the tank exteriors and 3003 alloy sheeting is placed outside of the insulation.

A frameless semi-trailer dump body built by Williamson Body and Equipment Co., Ogden, Utah, is used to carry uranium ore from the Hidden Splendor Mine into Moab, Utah—a 60 mile haul.

The payload for this unit is 44,000 lbs., a full two tons greater than in comparable trailers made of heavier metals. This permits an extra profit of $36 per day per unit, assuming six trips per day during the 16-hour period of operation. The trailers are expected to last five years. Operating economies pay off the additional cost of aluminum in less than 100 working days, according to Willard. The body is constructed of 5086 alloys using 6061-T6 extruded structurals.

A 1040 cu. ft. double hopper aluminum trailer built by Butler Mfg. Co. is hauling bulk commodities such as coal, cement, alum, rock salt, fertilizers or feeds. The 5052 alloy unit is equipped with a hydraulically operated unloading auger.

Aluminum cylinders for holding liquefied petroleum gas are manufactured by Benson Mfg. Co. Recently approved by Specification ICC4E, the cylinders offer light weight and resistance to corrosion. Such cylinders contain 100 lbs. of gas and weigh 48 lbs. each, offering a saving of 22 lbs. per unit compared to similar steel cylinders. These cylinders are made from two drawn shells of 5154 alloy.

For Ships and Boats . . .

As examples of marine applications of 5000 series aluminum alloys, Willard cited the S. S. Sunrip, built for Alcan Saguenay Terminal, Ltd. for the transport of alumina from Jamaica to Kitimat, B. C. The Sunrip contains 136 tons of aluminum, including unprotected 5052 alloy deckhouse skins. Another case history offered was a 52-ft. all welded crew boat built of 5154 alloy by Peterson Boat Yard for service in the Lake Maracaibo oil fields.

"Unprotected aluminum alloys exhibit at least ten times the resistance to corrosion shown by mild steel in this water," Willard said. "Therefore, aluminum pipelines, drilling templates, and numerous oil country structures are made of aluminum for service in Lake Maracaibo."

He also referred to the racing yawl Dyna, winner of two Mackinac Island races. Construction of the 5154 alloy hull of this prize winning sailboat was detailed in Modern Metals (Sept. '57, p. 37).

Heavy Duty Structures

High strength for crane structures is being supplied by alloy 5456. Examples of this type of structure are cranes built by Northern Engineering Works, Detroit, and the Milwaukee Crane Co., Milwaukee, Wis. These box girder cranes span 52 feet center to center of crane rails.

Willard also described the aluminum highway bridge built for the Iowa State Highway Commission for installation earlier this year near Des Moines (MM, March '58, p. 26). This bridge was a joint research project of Alcoa, Kaiser Aluminum and Reynolds Metals Co. Pullman Standard Car Mfg. Co., Chicago, fabricated the structure using alloy 5083-H113 welded with 5183 filler wire.

■ ***Aluminum is replacing steel in the construction of 36-ft. purse seine boats that work in pairs to net menhaden along the U. S. eastern coast. A fleet of 78 welded aluminum boats of Fish Products Co. consumed close to 400,000 pounds of alloy 5052. Aluminum's resistance to sea water corrosion is expected to cut maintenance costs. Operating expenses may also be lowered by reason of aluminum's weight reduction of 3000 pounds per boat as compared with steel.***

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how a missile maker

FINISHES MAGNESIUM

by
E. I. Weed
Process Engineer
Convair Division
Pomona, Calif.

The U.S. Navy's Terrier, a surface-to-air anti-aircraft missile, has been operational for a number of years. In producing the missile at its Pomona plant, Convair has accumulated considerable experience in finishing magnesium in missiles. Results of this experience are given in this paper, presented at a magnesium technology symposium, held in Los Angeles.

A GREAT deal of work has been done in recent years to improve methods for finishing magnesium. However, we have been rather slow in adopting new protective methods which will make magnesium work satisfactorily in missiles and aircraft.

This paper is confined to describing how we finish magnesium in the Terrier and Tartar missiles. The Terrier has been a tactical weapon for some time now and consequently we do have field experience on missile carriers, missile cruisers, and ammunition ships. So these missiles have seen ammunition ship storage conditions which amount, in most cases, to no more than cargo ship conditions. Consequently they have seen the sea-going conditions that the Bureau of Ordnance expects a tactical missile to see.

Magnesium is employed in the Terrier and Tartar wherever it is practical to take advantage of the metal's favorable strength-to-weight ratio. Most magnesium parts in Terrier and Tartar are AZ-91 castings—control surfaces, missile fins, booster fins and body structure. Non-structural magnesium parts are in the electronic section for tube boxes, electronic components, package cases, access door covers, and mounting beams.

Our present production system for finishing magnesium in Terrier missiles has been used since 1953. We start out with the dichromate treatment or Dow 7, followed by a wash primer which is an improved version of the mil spec vinyl butyrate zinc chromate primer. It has two advantages over the mil spec material; its spot life is considerably longer, and it will serve as a finish coat, if desired. It has another resin in addition to the vinyl butyrate.

Then we use two coats of epoxy phenolic baking varnish. We are fortunate in that our production setup was originally designed for baked coatings and our parts are small enough to use ovens, so that this is a flow system production.

The reason for a clear chrome yellow is that the customer requests that wherever we use two coats of the same material that one of them be colored so that they can tell that both coats are there. Then, on exterior surfaces, two coats of Mil E 163663 ammunition enamel are applied.

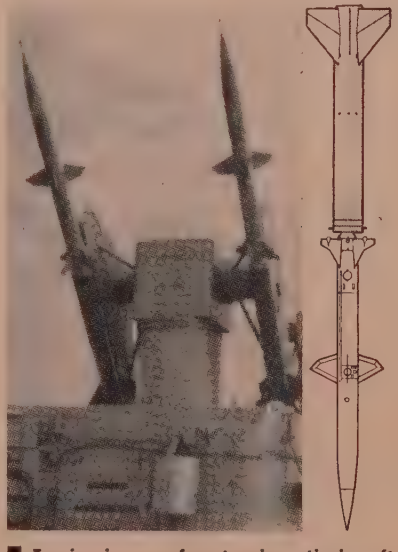
Quick Drying Finish

The two coat system with this material is not prohibitive from a production point of view in that the Type 1 Class 2 is a very rapid drying material. Actually, the second coat of enamel is applied within three to six minutes after the first coat, and the two are flash baked together.

The interior finish is the same as the exterior with the exception that enamel coats are not used. An alternate system that we are using on some parts, and which we consider to be equal to our production system, consists of Dow 17 in place of Dow 7. It eliminates one coat of epoxy, taking advantage of the extra protection derived from the anodic coating.

The one disadvantage of this system from our point of view is that we do not have the Dow 17 facilities. I'm working to get the company to put them in. As it is, we have to send the parts out.

On non-structural interior parts, where finishes will cause tolerance problems, or where we have blind areas or hard-to-reach areas, we do not require paint coatings. These would be such things as tube blocks or electronic cases. We use the heavy Dow 17 without further treatment. On parts that can be finished we specify the light Dow 17 treatment followed by one coat of epoxy-phenolic baking varnish.



■ *Terrier is a surface-to-air anti-aircraft missile with a maximum velocity of mach 2.5. Magnesium is used in control surfaces, booster fins, body structure, and electronic components.*

Advantages of Epoxy

Our reason for specifying a wash primer on all structural exterior parts is due to assembly operations that take place after the heat treatments. Consequently, these parts do not progress directly from heat treatment to paint, and the wash primer serves as an assurance that the part is in good condition to receive paint. Any breaks in the dichromate treatment, any possible contamination, is at least partially taken care of.

There is another advantage in using the baking type finish. It serves as an excellent protective coating for detail parts that are subject to later assembly and checkout. Due to the very tough abrasive resistance of this coating, all our parts progress through the shop with the final epoxy coating applied.

The final enamel coats are not applied until the missile is completely checked out and ready for shipment. Then enamel coats are applied to the exterior, and flash baked with an infra-red setup which is controlled by a timer so that there is no chance of overheating electronic components that might not be able to take elevated temperatures. Then stenciling identification is applied

the missile is ready.

this way we do not have to re-paint issile with the final enamel colors use very little happens to it from stage. This system was arrived at ugh bitter experience. Not only did iles have to be recoated before the omer would buy them, but also we id this added extra weight.

ome missiles in the early stages of program were going to the field as many as three or four color coats rely because they were dirty, tched, or had enough defects that y would not be accepted. Touch-up the epoxy coating prior to enamel ting, after all check out and assem- operations are completed, is prac- ally nonexistent.

Avoid Masking . . .

Another advantage with epoxy is the of a special processing sequence. e have electronic mounting beams— agnesium castings that have over 100 eaded holes for mounting electronic mponents. To finish these in the nor- al manner would mean masking all the holes to keep the paint out of e threads.

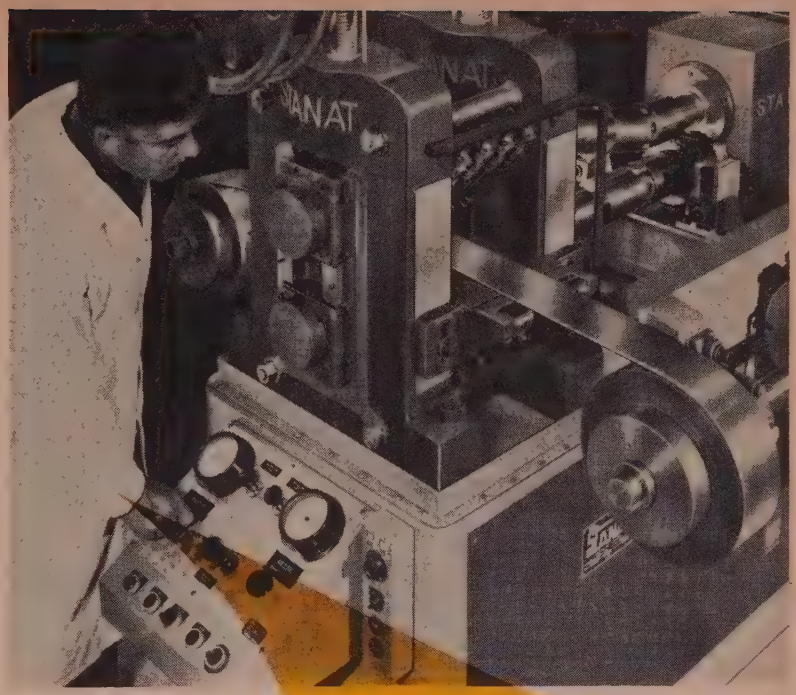
To get around this expensive opera- on, the casting is machined on the t areas, taken into the process de- artment where the dichromate, wash rimer, and epoxy coats are applied and aked, then back to the machine shop here the 100 holes are drilled, then eturned to the process area where it is ut through the dichromate treatment ith the epoxy coating in place.

It comes out in perfect shape with the lichromate taking only on the areas where magnesium has been bared by machine operation. This saves a great many hours of masking. Masking of articles for paint can be very expensive — in many cases, more expensive than the actual paint operation.

At the present time, no high temperature magnesium alloys are being used in the Terrier program. However, thorium-magnesium and thorium-zirconium alloys are being considered in future designs.

The particular system we use will work. I don't mean to imply that epoxy phenolic is the only material. There are a great many modifications of epoxy that are very successful. They include epoxy esters and epoxy silicones.

The specifications that I have quoted here were written at the Pomona division and approved by the Bureau of Ordnance for use in these missiles. I don't know how far they have gone with this particular group of specifications. However, anyone wishing copies of them can undoubtedly get them through their particular military agency to our local Navy office in Pomona.



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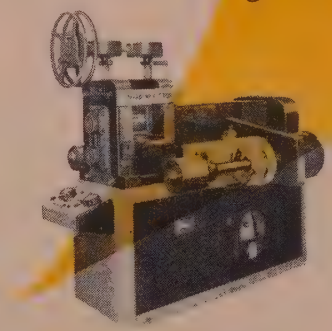

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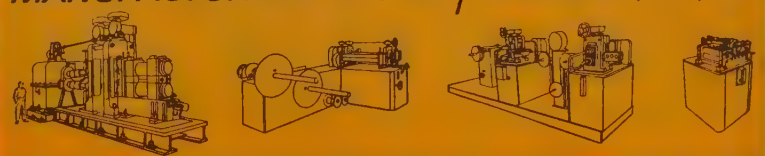


MFR'S OF ROLLING MILLS, GANG SLITTERS, WIRE FLATTENING MILLS, ROLLER LEVELERS AND BULL BLOCKS

PROGRESS REPORT:

ALUMINUM OIL CANS

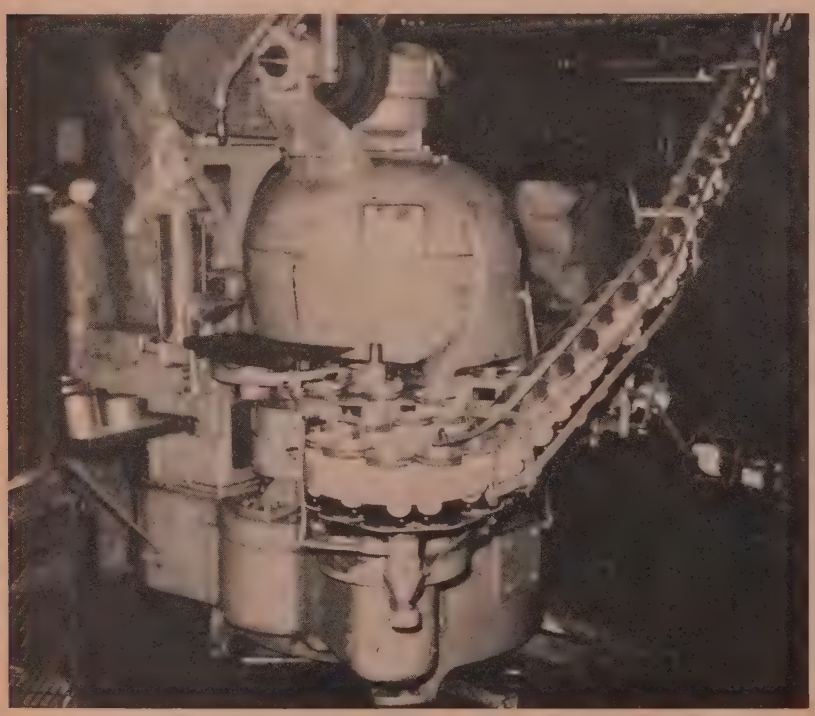
National Can Corp. using modified tin-plate can making machinery in filling its part of 60 million unit a year Reynolds-Esso Standard contract. Can making procedure described. Empty can salvage plans being appraised.

DURING 1958 National Can Corp. produced about 10 million 1-quart aluminum oil cans for the Reynolds - Esso 60-million-unit a year contract. Under the agreement with Reynolds Metals Co., National will manufacture a total of 25 million cans at its Baltimore, Md. plant for delivery to the big Esso Standard Oil Co. refinery there. The other supplier is Crown Cork & Seal Corp. (see MM, Oct. '57, p. 78). American Can Co., a third participant, bowed out last year.

National Can uses the same equipment slightly modified, that it uses in making conventional blackplate or tinplate cans. Since aluminum is more ductile and easier to form and shape, less pressure is required on forming operations. To adjust pressure, spring and tension gauges must be modified. Lighter pressure, incidentally, reduces equipment wear.

Bodymaker slide parts which contact aluminum are Teflon coated for smooth operation. Diecut edges for cutting ends are Stellite coated and the die cores made of Amco Bronze. Where magnets were used on automatic sheet feeders to separate sheets of tinplate, air lines are installed to handle non-magnetic aluminum.

The aluminum sheet, .010-in. thick, three-quarter hard, is shipped directly by truck to the Baltimore plant from the Reynolds plant at Listerhill, Ala. Aluminum for the can body is received in sheets cut to size for twelve body blanks a sheet. Pallets carry approximately 1800 sheets each.



■ *One-quart aluminum oil cans move in upside-down position to double seamer where bottom ends are joined to the can body. National Can Corp. made close to 10 million of these cans for Esso Standard Oil Co. in 1958, using Reynolds aluminum sheet.*

Since no interior coating is necessary, the first operation is decorating in the lithography department. The white background color is laid down first, using two separate prints of white, then baked in the drying oven after each operation. When the coat is dry, the aluminum is ready for the red and blue prints, with protective varnish applied over the wet inks. This is performed on a two-color metal decorating press with a wet varnish machine in tandem. The varnished wet inks are oven dried.

Decorated aluminum sheets are transported by lift truck to the can assembly shop where they are slit into body blanks of required size. Only .005-in. tolerance is permitted. Blanks are stacked in the magazine feed of the bodymaker can line to start the continuous automatic operation of assembly through carton packaging. Starting with the bodymaker which operates at 18,000 units per hour, the steps are as follows:

Bodymaker: 1. Notches corners of the body; 2. edges (forms side seam hooks); 3. applies side seam thermoplastic cement; 4. forms cylindrical body; and 5. expands and locks side seam.

Flanger: Flanges top and bottom of can cylinder.

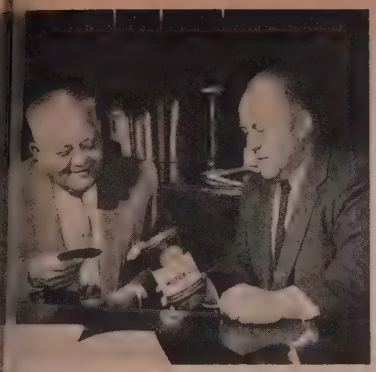
Double Seamer: Assembles and seams bottom to the flanged cylindrical body.

Tester: Automatically tests cans by air pressure and rejects any defective leaking cans.

Automatic Packer: Packs 24 cans per carton and glues bottom of carton. Cartons then go by belt into freight cars for shipment to Esso's packaging plant.

Aluminum for can tops and bottoms is received in sheet form on pallets holding about 1900 sheets each, sized for 30 ends a sheet. These sheets do not require lithography before ends are stamped out.

After the sheets are trimmed, they are taken to the large "five" die punch press where individual sheets are auto-



Robert J. Solinsky (left), president of tional Can Corp., and J. Louis Reynolds, cutive vice president of Reynolds tals Co., examine one of the 1-quart minum motor oil cans made by Na- nal for Esso Standard Oil Co. National nder contract with Reynolds to supply to 25 million of the cans for Esso.

tically lubricated and fed into the ss, which cuts five ends per stroke. en the ends are automatically con- ed into curlers which form a gutter the outside end of the can to receive npound. A belt feeds the curled ends o compound lining machines and ough drying ovens.

Ends are placed in stock for double ming the bottom on the body. Tops e packed in paper sleeves, 250 to a ckage, and trucked directly to the so packaging plant.

"Aluminum cans present no corrosion oblems, regardless of weather," Na- onal said. "Their lighter weight makes r lower transportation costs; and the ailability of new materials and sup- iers adds both flexibility and a safe- ard against shortages which might cur under unusual conditions.

ut It Costs

"On the other hand, the cost of alu- inum limits its use as a substitute for onventional can making materials."

Reynolds is still exploring various ethods of getting the empty cans back r remelting.

A system for reclaiming used cans om filling stations is in "pilot opera- on." Broadly used, it would reduce the st differential between aluminum and onventional tin plate. A special com- ressed air can crushing device squeezes e used can (four inches in diameter nd about six inches high) into a flat in-shaped slug and deposits it in an l-drum "bank" for storage until sal- ge collection is made.

"Unlike the conventional can, alumi- um cans having high scrap value may e salvaged for re-use in producing alu- inum," a Reynolds spokesman said. e estimated deliveries to the can-mak- g companies at the rate of 500,000 ounds a month, and that about 51 tons f aluminum are consumed per million ans manufactured.

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TITANIUM TUBING

TOPS FOR PLATING TANKS

Plater finds that ductile, corrosion resistant titanium tube stands up well in 25% chromic acid electroplating solutions

TITANIUM tubing has proven to be the most practical material for heating and cooling chromic acid solution in electro-plating installations. This conclusion was reached after a thorough investigation of tubing materials by Van der Horst Corp. of America, Olean, N. Y., one of the largest chromium platers in the world.

Tubing used by Van der Horst is 1-in. O.D., .020-in. wall, grade A-40 seamless titanium tubing supplied by Superior Tube Co., Norristown, Pa.. Grade A-40 is specified because it is the most ductile titanium commercially available in tubing form.

The tubing has been used in five plating tanks containing 25% chromic acid plating solution — one of the most corrosive chemicals used by industry. The tubing, some of which has been in service more than a year, has shown no evidence of attack by the acid.

The most satisfactory method of controlling the temperature of plating solution is to heat or cool it in the tank. This is done by pumping steam or water through tubing immersed in the solution.

Stringent Requirements

Primary requuirement for the tubing is ability to withstand corrosion by the chromic acid solution. Should it corrode through, the plating solution would be diluted or lost by siphoning or overflow. The tubing must also readily transfer heat. It should not only be a good conductor but also thin walled to facilitate heat transfer. It must also withstand steam pressure (15 pounds psi) and water pressure (100 psi).

Finally, the tubing must be ductile enough to withstand bending into hairpin shapes without cracking.

One of the first materials used by Van der Horst was lead tubing. It had the corrosion resistance and was easily formed, but was so ductile that it required considerable support, and so soft that it was subject to damage from fixtures in the tank. Also, weak spots made it susceptible to bursting from momentary high steam pressures, and it had poor heat transfer.

Steel tubing has been used temporarily, but it cannot be used as a permanent accessory because the welds eventually corrode and the fittings (usually cast iron) may corrode rapidly. The most satisfactory material used prior to titanium was tantalum tubing. Its principal disadvantage has been uncertainty of supply.

Van der Horst engineers see titanium tubing as the probable answer to their problem, but they'll wait until it is in service two more years before making a final evaluation. At $7 per foot (in .020-inch wall) it costs a little over 1/6 as much as .013-inch wall tantalum tubing, yet is just as resistant to chromic acid. Delivery is no problem since Grade A-40 titanium tubing is a standard analysis at Superior Tube. Van der Horst buys it through the Buffalo office of Peter A. Frasse & Co., Inc., a Superior distributor.

How It's Bent

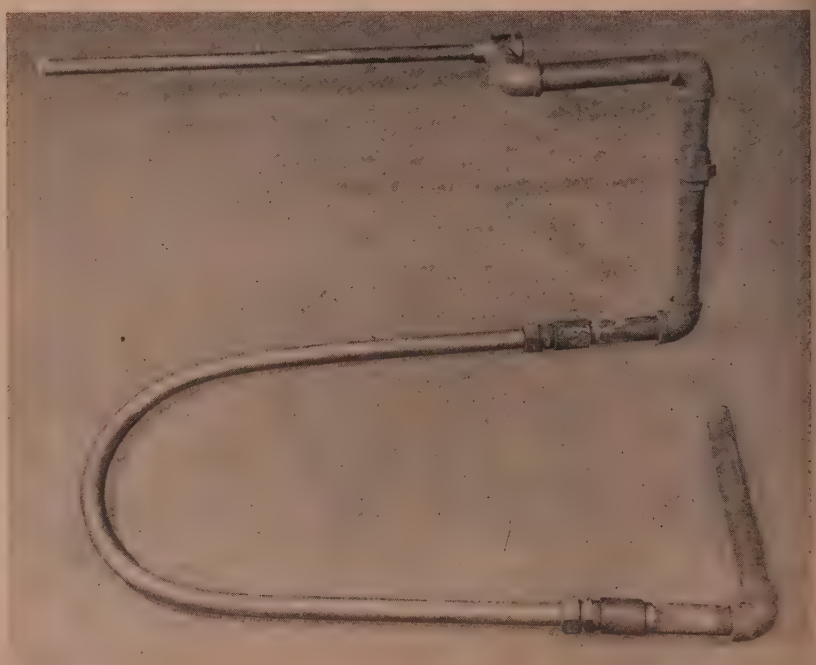
The tubing, in 15-foot minimum lengths and soft annealed for maximum formability, is filled with Woods metal and then bent on a conduit bender to the hairpin configuration. The bent tubing is then installed by connecting to water and steam pipes.

The 15-foot lengths make it possible to keep all joints above the plating solution while the tubing itself reaches almost to the bottom of the tank. This guards against leakage of steam or water into the tank which might result from corrosion at joints.

Van der Horst also uses titanium tubing for wells for temperature control sensing elements in the plating tanks. Here, too, there has been no evidence of corrosive attack on the metal.

Superior Tube was one of the first firms to engage in titanium research and development and pioneered in the development of titanium tubing. Titanium, one of 121 standard and special tubing analyses produced by the plant, is furnished both seamless and Weldrawn (welded and drawn) in sizes from .062 to 1.125 inches O.D.

In addition to grade A-40, Superior produces tubing from grade A-55 titanium for applications where increased tensile strength but less ductility is required.



■ *This test piece of grade A-40 seamless titanium tubing was found to be highly suitable for heating and cooling plating tanks. The most ductile titanium commercially available, the tube is easily bent in the U-form. It is unaffected by 25% chromic acid solution and is a good conductor of heat. Superior Tube Co. supplied the tubing.*

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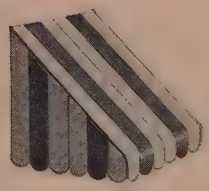

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NEW PROCESS PLATES CHROMIUM ON ALUMINUM

Chrom-Lume process deposits chromium directly on aluminum to produce a strong adherent bond and a wider measure of ductility for greater stress absorption than offered by other plating processes. Successful applications are reported in many fields.

CHROM-LUME is the name of a completely new method for plating chromium directly on aluminum and its alloys, according to Service Hard-Chromium Co., Route 22, Union, N. J., developers of the process.

According to George Hompesch, president of the company, the new process, presently available to industry in the New York-New Jersey metropolitan area, is unique in that it provides for direct coating of chromium to the basic metal with no intermediate metallic deposition of copper, nickel or zincate needed. Affording a strong adherent bond between the two metals, Hompesch added, the Chrom-Lume process eliminates the possibility of galvanic action and also prevents undesirable electrolytic couples.

Service Hard-Chromium's Research Division engineers refer to the process as "3-D" — the method being direct, dense and extremely ductile.

The extremely hard and dense deposition of the chromium — directly applied — provides high anti-abrasive action and imparts longer wearing qualities to the aluminum. The dense application also affords high torsional and impact load with a very low coefficient of friction heretofore unattained by any other aluminum alloys, the firm reports. Also, oxidation is considerably reduced by the process.

A wider measure of ductility is offered with Chrom-Lume, which allows greater stress absorption than previously attained by other plating methods. In laboratory tests, severe deformations made by inflicting sharp tool indentations — such as hammer and chisel blows — showed the chromium coating ductile enough to withstand chipping, peeling, cracking and flaking. Other comprehensive and sheering stress tests indicated a flow of the coating with the basic metal, instead of a spalling action.

Other basic advantages of the Chrom-Lume process are: Uniformity of deposition; even in deep recesses, thickness of the coating does not affect any post grinding or lapping; the plating's color finish is a sapphire grey which can be buffed to a bright luster.

"The applications of the Chrom-Lume process are many and varied," a company spokesman said. "The combination of less costly metals and machining with weight reduction and better wearing qualities make it one of the outstanding advances in the metal plating field."

The Chrom-Lume process already is in use in the chemical, pharmaceutical, food, electronic, aviation and astronautical fields. Such items as fasteners, gears, pinions, pumps, valves, flow control devices and pulleys already are being plated on repeat orders.

After close inspection of parts to be plated, they are thoroughly cleaned in a special solution to remove dirt and oxides. Once the desired deposition is determined, special racks and anodes are made to suit the required uniformity and thickness.

How It's Done

The part is then placed in the plating tank held at proper temperature, and the timing control mechanism is set for the exact thickness of plate desired plus required current. Immediately when the correct plating is completed a bell rings, indicating that the piece is ready for removal; it also shuts off the current preventing further plating.

The electronic brain is also lighted designating the particular piece to be removed from the tank. After removal, the piece is washed thoroughly to remove any chromic acid, air dried and turned over to the inspection department for final examination.

While the cost of the Chrom-Lume process is slightly higher than conventional hard chromium plating, this is readily offset by material and machinery costs of heavier, more expensive metals, as well as by savings on repairs and replacements."

Other Service Hard-chromium plating processes include: Chrom-Tule, conventional hard chromium plating to meet all standard and government and industrial specifications; A.P.X., specialty plating on ferrous and nonferrous metals; H.P.H., hard chromium for maximum corrosion resistance. The latter process is used extensively in instrument and precision mechanism plating.

■ *A magna gauge being used to determine both uniformity and thickness of plate which has been applied by the Chrom-Lume process. Control is usually maintained in tenths, and certain production runs in micro finishes.*

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CUTTING ALUMINUM JOINTS faster, smoother fitting

Cutting pipe for aluminum joints that are to be butt welded is done faster and more accurately than by conventional cutting methods thanks to new technique developed by Wallace Supplies. Uniform fit and smoothness of surface eliminate reworking.

by M. S. Greeley

AN AUTOMATIC method for cutting and fitting aluminum joints in preparation for butt welding is said to be many times faster than other methods and provides a smoother fitting joint which is easier to weld.

Wallace Supplies Manufacturing Co., 1300 Diversey Parkway, Chicago, Ill., introduced the new method at a plant demonstration attended by representatives of the major aluminum producers, Westinghouse and several expert welders. Afterwards the 16 visitors gathered around a discussion table with six Wallace men to ask questions and give their opinions of the new method. An impartial moderator presided.

The new method was developed by Ed DeWitt of Wallace. This system of joint preparation is done on any one of the Wallace modulars by interchanging the surface plates, DeWitt explained. To do this it is only necessary to loosen four nuts, lift off the standard surface plate and replace with a special surface which has mounted on it a specially designed fixture (illustrated).

With the aid of a chart of tabular and angular settings it is possible for an operator to produce the joint in 2½ minutes or less. The larger machine cuts joints in aluminum tubing up to 6⅝ in. O.D. A smaller model with smaller wheel cuts 2⅜ in. O.D. or 2 in. standard pipe.

The machine was placed on the market by Wallace in January. A patent is pending on the machine, and the chart giving the angles for cutting has been copyrighted. Wallace is the exclusive producer of the machines in the U. S. B. O. Morris Ltd. of Coventry, England may also be licensed to sell the method.

■ *Welder in action using Westinghouse Automatic equipment. Addition of filler material is not necessary for a smooth weld which is as strong as the tube itself. Wire electrode from welding gun fills in the uniform 30 degree bevel.*

No Rework Needed

During the demonstration aluminum tubes measuring 2, 4, and 6 inches in diameter were on the machine to specified angles up to 90°. Alloy was 6063-T6. The cut pipe was welded to another aluminum tube, using either the Hobart manual welding torch or Westinghouse automatic welding machine with consumable electrode.

Actual welding time is not appreciably altered; it still took about five minutes to weld a 4-inch pipe. But the uniform fit and smoothness of the surface made it unnecessary for the welder to rework the tube. Thus, in practice, it should simplify and shorten the welder's job.

The method is applicable to any metal including steel, stainless steel and bronze, as well as aluminum. Its use for aluminum is probably most significant. While it has been possible to economically butt weld steel at various angles, 90° butt welds of aluminum tubing were produced only by a costly, time consuming process.

■ *The special attachment for cutting tube of any nonferrous metal is shown mounted on a standard Wallace cutting machine. The moveable platform has been adjusted to the proper position for making the first of three cuts necessary to fit a welded joint.*

A semi-skilled workman would have to make a template on the pipe, then cut along the pattern with a hacksaw. Often he would produce an irregular edge which the welder had to rework in order to produce the proper weld, or he would miss the pattern and saw an inaccurate angle.

The Wallace method minimizes error in the angle of cut. The operator dials angles on the machine for three cuts, and between cuts he swings the pipe around to the proper position. The cutting process takes two or three minutes.

Secret's In Charts

Key to the cutting method is the chart giving machine settings. At the Wallace demonstration, three charts were posted; one each for 2, 4, and 6 inch diameter pipe. Each chart listed the angles between 45 and 90 degrees at 5 degree intervals, and the second column gave the difference between the desired angle and 90°. For example the machine would cut to 30° if an angle of 60° was desired.

The next three columns gave machine settings for cuts 1, 2, and 3. Cut 1 was expressed as a plus number, cut 2 as a minus number, and cut three as a plus number and a push of a fraction of an inch given to the pipe before cutting.

The machine cuts a bevel of about 30° all around the tube, with the excep-

E. J. DeWitt, vice president of Wallace Supplies Mfg. Co. and inventor of the new cutting method, points to cut aluminum pipe which is ready for the welder. Samples fit smoothly over the pipe at various angles. The uniform 30° bevel is visible on the cut edges of the tube in the row to which DeWitt points.

ion of the heel. Uniformity of the bevel implifies the welder's job. With the built-in groove it is possible to get deeper penetration of the weld material.

At the panel discussion after the demonstration, a welding company spokesman declared that a skilled operator could get 100% penetration using manual welding. A Reynolds Metals representative added that the "joint preparation allows a welder to get penetration to the root of the joint with minimum effort and without hand working after the joint has been fitted."

The joint prepared by the Wallace cutting machine appears to be as good as any theoretical joint configuration which could be proposed for this kind of welding operation.

The joint is claimed by Wallace to be as strong as the pipe itself. Samples of the welded steel joints submitted to the Robert W. Hunt Laboratories were reported as qualified welds for structural applications. The aluminum test welds prepared during the demonstration were also submitted to Hunt Laboratories, and the aluminum producers were invited to bring samples to Wallace for welding and testing.

The lower cost of preparing aluminum tubing for welding may open up some structural applications to aluminum.

Implications for Aluminum

Everyone at the panel seemed to agree that the Wallace joint was as good as or better than any joint of its type produced in aluminum and that it was cheaper and quicker to prepare.

The method may help increase the use of aluminum in most structures which require much welding, DeWitt said. Applications will be in towers for petroleum rigs, high tension lines, rocket launchers and radar screen frames, aluminum railing and above deck structures for radar in ships.

The question arose at the panel as to whether the method would actually make aluminum competitive with steel since it also decreases the cost of welding steel.

Proportionate decrease in cost is not as great for steel, DeWitt explained. Whereas a steel structure which would normally take 100 hours could be completed in 25 hours with the new cutting method, a comparable 200 to 300-hour job in aluminum could now be done in 40 hours. Moreover, steel rusts and the low maintenance cost of aluminum will be an important factor favoring its applications in structures now made of steel.

Several of the aluminum producers have ordered literature on the method to be sent to their field engineers throughout the country, and fabricators using their aluminum may soon be ordering the machines.

DeWitt disclosed that he had already received two orders for the machine but that these were from steel fabricators. Larger machines will be produced to cut tube 14 ft. in diameter or larger and some of these will possibly be leased.

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Coors writes

"Project Completed" in Beer Can Development

Impact extruded seven-ounce cans are made economically and quickly; look inviting; should speed light metal's acceptance in market for 60 billion cans.

■ *William K. Coors, president of Adolph Coors Co., wears a happy smile as he displays the fruits of a four-year research and development project — an aluminum impact extrusion slug and the resulting seven-ounce beer can.*

CULMINATING four years of comprehensive research, beer brewed and packaged in aluminum by the Adolph Coors Co., Golden, Col., was introduced to the Denver market late last month. The event could point the way to ultimate adoption of the aluminum can by the U.S. brewing industry, consumer of about 20% of the nation's 60 billion can production last year.

Lending encouragement to this view is the report that Coors has solved the problems of economic manufacture of aluminum cans. The steadily rising price of tinplate has taxed the ingenuity of the can manufacturers in keeping unit can price at a reasonable level. Tin can costs have risen about 7% per year in the past 10 years.

The lightweight cans that made their debut January 28 hold seven ounces—little more than half the size of the conventional 12-ounce tinplate beer can. They are being retailed in eight-packs.

The beer is sterilized by ultra-filtration instead of the usual pasteurization process, and as such is a true draught beer which has never been subjected to heat. Company officials stress that distributors, retailers and consumers should keep the cans chilled to preserve the draught beer flavor.

An important point in connection with the aluminum cans is that they will be returnable at one cent apiece. Coors hopes this salvage feature will help reduce litter on highways and in picnic grounds.

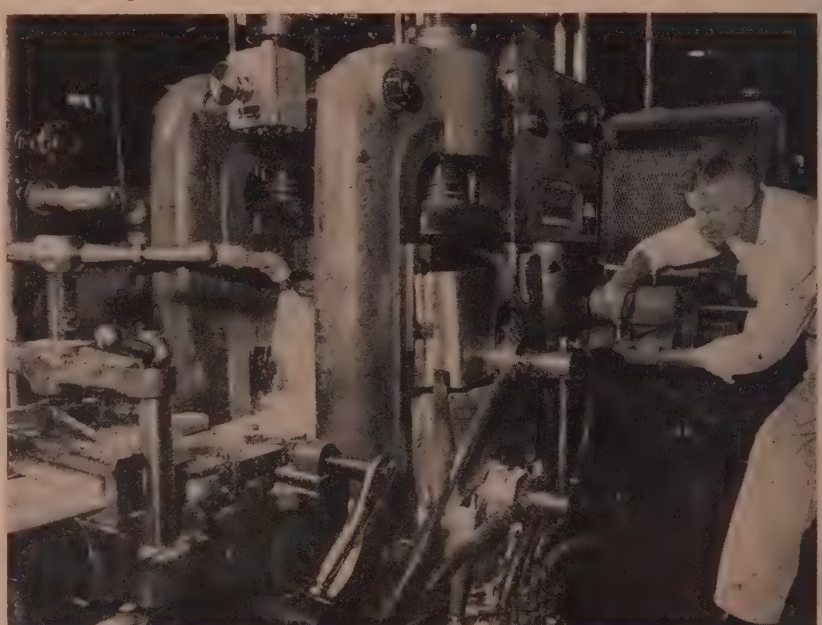
Coors has carried on a research and development program to solve the problem of manufacturing seamless aluminum cans since Aluminum International, Inc. was organized in 1954. This corporation was formed by Beatrice Foods Co. and Adolph Coors Co. for the purpose of developing an economic process for manufacture of aluminum cans for food and other industries.

Research Partners

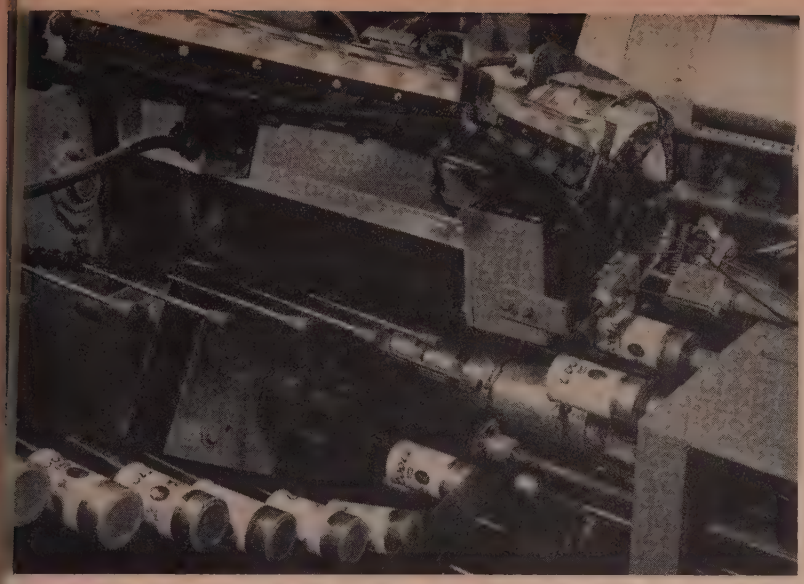
Both companies had been considering the possibilities of an aluminum beer can—Coors for its own brewing operation in Golden, and Beatrice for its brewing operation in Honolulu (MM, Aug. '58, p. 50). Conventional beer cans were not available to the Hawaii Brewing Corp. and an aluminum beer can to be manufactured by the brewery itself seemed the answer to the beer can problem. The companies decided to join forces and Aluminum International, Inc., was formed with Coors as the research and development arm of the project. Coors built a special plant in Golden and began to design and develop machinery to put the program into effect.

"That was four years and 4000 research headaches ago," said William K. Coors, president of the firm. "Now, we've perfected the aluminum beer can process and are passing its product along to the greatest critic of all, the consuming public."

Coors' lightweight aluminum cans—they weigh only 40% as much as comparable tinplate cans and are equally as strong—are made by a completely



■ *Aluminum strip, continuously cast, is rolled down in this hot mill at the Coors can plant, then is cooled and rolled to final ⅛-in. thickness in a cold mill. Then the strip is fed automatically into a blanking press which produces the slugs. The brewing firm might eventually package its product in a larger can.*



Here the Coors beer cans are being decorated in a four-color cylindrical offset hography press. Coors engineers redesigned the machine to print four cans in one volution of the drum and have the unit gaited to overall can-making line speed.

ttomatic line. The heart of the proc- s is an aluminum impact extrusion ug, which is 2-3/32 inches in diameter id about ⅛-in. thick.

Coors buys 50-pound ingots of 99.5% ure aluminum from prime aluminum ppliers. First step in the can making rocess is to melt the pig in an electric rnace which operates at about 1300° . From the furnace the molten alumi- um goes through a continuous casting peration. After two years of study, oors engineers perfected the process f continuous casting thin, wide sec- ions of aluminum strip. They designed casting wheel to control the variables, nd successfully began to cast continu- us aluminum strip about a year ago.

The wheel produces aluminum strip ½-in. thick and from 4 to 8 inches vide, depending upon process require- nents, at speeds up to 4000 pounds of luminum an hour. The strip is then educed in a hot mill, cooled and olled to final thickness—about ⅛-inch —in a cold mill.

They Blank the Strip

A blanking press knocks out the aluminum slugs at the maximum rate of 3000 pounds of slugs per hour, roughly the equivalent of 66,000 cans hourly. Blanking scrap is returned to the melting furnace.

Coors claims to be the first company to perfect an automatic process for the conversion of aluminum ingot into impact extrusion slugs by continuous strip casting, rolling and blanking. This process gives the company a low cost conversion of aluminum ingot to slugs and is the essential key to the economic manufacture of aluminum cans.

From the blanking press the slugs go into an annealing furnace to soften them sufficiently for impact extrusion and then are washed, deburred and lubricated.

The actual can making process begins with two German-made Herlan Model P-8, 400-ton impact extrusion presses, both fully reworked by Coors to adapt them to the aluminum can process. Each of the presses extrudes 3600 flat-bottomed seamless cans per hour by hitting the thin aluminum discs in a die with a hardened steel punch. After impact extrusion, the cans are trimmed to length and flanged, degreased and mildly etched, and rinsed.

Then the cans are decorated in a four-color cylindrical offset lithography press made by the Alfons Mall Co., Germany. When originally installed by Coors, the press printed only one can with each revolution of the drum. Now, after reworking, it prints four cans, and normally is operated at a below-capacity speed of 6000 to 7000 cans per hour to conform to the overall speed of the can-making line. Coors is believed to be the first company to do the entire can decorating job in one pass through a rotary lithography press.

Simultaneously with application of four colors—Coors' familiar buff, gold, red and black—the press puts an overcoat of finishing varnish on the cans. The decoration is bake dried in an oven, a protective internal coating is automatically applied, and the cans are baked once more.

They are then ready for filling and packaging. This is being done at a separate Coors plant in Golden, but plans have been perfected to make filling and packaging a non-stop part of the revolutionary new can making process from ingot to 8-pack ready for delivery.

At the brewery the cans are fed into an unscrambling device, onto a conveyor, rinsed and flash sterilized. Then they are conveyed to a filling and closing machine in a hermetically sealed room. Air in the room is electrostatically filtered and ultra-violet rays are in constant use as an additional sterile control.

In this completely sterile atmosphere, the cans are filled automatically, presterilized convex aluminum lids (also manufactured by Coors much like the slugs) are crimped on, cans are externally washed, fed through an X-ray device which checks for proper filling, and are automatically cartoned in 8-packs.

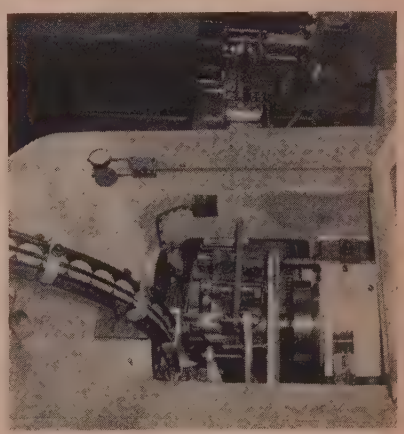
Coors feels that the aluminum can, in its present state of development, can be reasonably competitive with the tinplate can only if a food or beverage processor is willing to make his own cans.

The company plans to offer its findings to industry, and presently is negotiating with several prospective aluminum can users. Coors already is shipping aluminum impact extrusion slugs to established industrial users and can companies in the U. S. and abroad.

The company is reported to be considering production of 11 ounce cans if the current development proves successful. The larger size can be made with present equipment.

Coors officials are highly pleased with what they have achieved thus far, but they know that beer lovers are the final arbiters.

"If we have come up with something really good, our customers will be quick to tell us so, and their response to this initial effort determines the future."



■ **One of two Herlan impact extrusion presses take the automatically fed slugs and punch them into Coors seamless beer cans at a rate of 3600 per hour. Coors engineers adapted the presses to the can-making process.**

NEWS, Products and People

Kaiser Cuts Conduit Price; Launches Educational Program

In a strong bid for a major market now dominated by steel, Kaiser Aluminum & Chemical Corp. has reduced the price of rigid aluminum electrical conduit to the point where its installed cost will be cheaper than that of steel in nearly all types of installations.

The new price schedule, which amounts to a 10% to 14% reduction depending upon diameter of the product and shipping zone, was announced February 11. The new per-foot, delivered price of Kaiser Aluminum conduit now averages only 2 to 3% above steel conduit.

"This new pricing schedule makes aluminum conduit more economical than steel in virtually all types of electrical installations," declared J. T. Dugall, general manager of Kaiser's electrical conductor division. "Even at the former price, aluminum conduit was frequently less costly to install because it is one-third the weight of steel, bringing considerable savings in handling.

"Over 800 million pounds of steel conduit were sold in the nation last year with little competition from other materials due to price," Dugall added. "With aluminum conduit priced equal to steel in several areas, and no greater than 4% higher elsewhere, it promises to open a major new market for aluminum."

Kaiser Aluminum produces a line of extruded aluminum conduit in standard diameters, plus conduit couplings and 90 degree elbows.

Approved by Underwriters Laboratories, these products meet the same size, shape and tolerance requirements as those for steel conduit. Nominal diameter sizes for Kaiser Aluminum conduit range from one-half through 6 inches in standard 10-ft. lengths. Larger diameters are available through special order. The conduit is chemically coated inside making wire pulling easier.

Aluminum conduit is one-third the weight of steel, non-rusting, highly resistant to corrosion, non-sparking and non-magnetic. Installation costs are less because the lightweight aluminum is easy to handle, train, bend and cut. Fewer supports are required for installation of larger sizes.

Two mobile vans for bringing door-to-door demonstrations on handling aluminum conduit to electrical contractors, distributors, utilities, plant electrical groups and special meetings have been placed in operation by Kaiser Aluminum.

The trucks (see cut) are equipped with all tools and supplies necessary for cutting, bending and threading standard aluminum rigid conduit. Inside displays feature conduit fittings and accessories manufactured by well-known firms such as Thomas & Betts, Burndy, Crouse Hinds, Adalet, Appleton, Toledo Pipe and Killark. Aluminum building wire terminals and connectors, and samples of Kaiser Aluminum electrical products are also displayed.

The vehicles are operated by specialists who are qualified to give complete instructions on the best installation procedures according to Gillet N. Houck, manager of promotion and technical development of the company's Electrical Conductor Division.

"There is a large potential market for aluminum conduit but it is necessary to make available practical information about the product before that potential can be realized.

"We expect aluminum to command as much as 75% of the conduit market by 1965," Houck added. "This depends, of course, upon the success of aluminum conduit manufacturers in promoting the product and getting information on its advantages and proper handling to the electrical industry. Our conduit vans were conceived for that purpose and we plan to equip others later on so that demonstrations can be given in all parts of the country."

New Facilities To Produce More Beryllium

Brush Beryllium Co., Cleveland, will expand its rolling mill facilities. At the company's Elmore plant a new building will be constructed to house additional cold strip mill facilities, additional machining capacity for billet and slab milling, and annealing facilities.

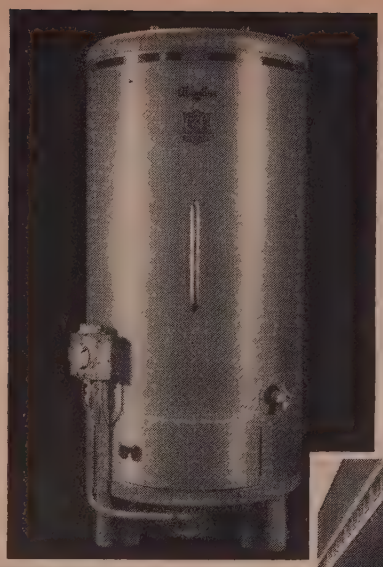
The present hot mill will be modified to roll wider beryllium sheet, and there will be additional facilities for finishing operations on the sheet. The program is expected to cost over $250,000.

"The expansion program is the result of increased marketing activity in the two chief products produced by Brush—high purity beryllium metal and wrought beryllium copper alloys," sales manager N. W. Bass said.

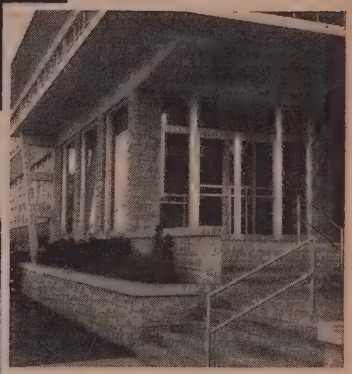
New Frit Process Will Improve Porcelain Enamel

Aluminum enamel frits, the base glass ingredient used in porcelain enameling, are being produced in flake form by Ferro Corp., 4150 East 56 St., Cleveland 5, Ohio. Advantages are increased uniformity, superior suspension in sl

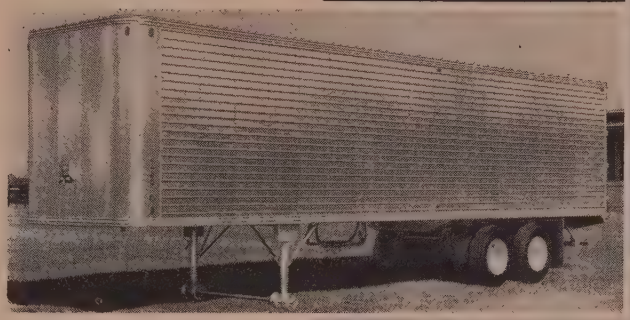
When aluminum is part of your product . . .



Appliances



Building Materials



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form, decreased "ageing" of milled enamel, and greater workability.

The accompanying photo shows molten glass pouring from the smelter onto water-cooled rolls below. The "quenched" or hardened glass will then be broken into tiny flakes by agitators.

Ferro pioneered the continuous smelting and roll-quenching which have long been used in the porcelain enamel industry for producing iron and steel enamels and ceramic glazes. They have never before been applied to the large-scale production of enamel frits for aluminum.

Ferro also announced new techniques for the use of the flaked aluminum frits along with new types of wet and dry mill-addition agents which provide greater flexibility in "tailoring" porcelain enamels for specific applications on aluminum.

These three developments represent the first major advance in five years in porcelain enamels for aluminum, according to William N. Noble, vice president of Ferro's Frit and Glaze Division. They should help to increase the use of porcelain enameled aluminum in building to the 14,100,000 sq. ft. estimated by the Porcelain Enamel Institute for 1959.

The Institute reports an increase of about 275% in usage of porcelain enameled aluminum in building in the past two years. Figures quoted are 3,500,000 sq. ft. in 1956; 5,200,000 sq. ft. in 1957; and 9,650,000 in 1958. Further increases estimated are 18,550,000 sq. ft. for 1960; and 23,300,000 for 1961.

Aluminum Grandstand Cover Saves Tons of Weight

Some 36,000 pounds of aluminum were used in the construction of a grandstand at the Fair Grounds in Stockton, Calif. by the Shadelite Marquee Co., Inc., Ord, Neb. The San Joaquin Fair Association first used the structure in August '58.

R. E. Walker, Fair manager, wrote: "We were 100% satisfied with the grandstand during its first operation."

The structure, which saved tons of weight required for conventional grandstand construction, was installed by the Shadelite Marquee Co. of Richmond, Calif. Cantilever beams supporting the seats and roof were fabricated from steel plate. Shadelite is the originator of the aluminum marquee.

Bright Filler Wire Cuts Welding Breakdowns

Bright finish aluminum filler wire is now being used in welding machines. All-State Welding Alloys Co., White Plains, N. Y., now produces a bright finish on any type of aluminum filler wire and sells it as Bright Wire Spoolarc.

The bright finish eliminates a common cause of breakdowns in welding equipment. Dull etched aluminum, which it replaces, acquires a whitish film which flakes off and clogs the feed rollers. The resulting non-uniform feed of wire causes "burn back." The arc travels back up the filler wire into the feed tube and chars it, causing work interruption. Records of a typical production line show the average cost of each such interruption as $8.39, with as many as ten a week.

All-State extrudes the wire. This is costlier than drawing, but the wire is inherently cleaner; and added cost is erased by savings on the job.

The bright finish added in an additional process makes the wire even cleaner and more uniform.

Alcoa Reckons 9% Rise In Cars' Use of Aluminum

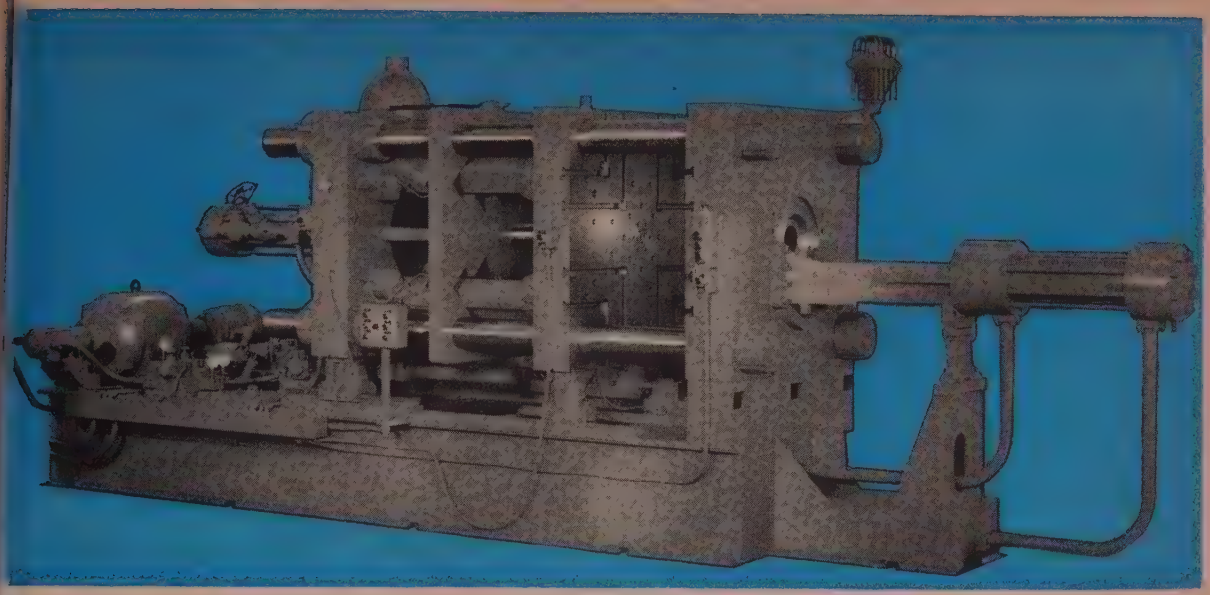
An auto industry prediction of 5.5 million unit sales of 1959 models, coupled with an average use of 51.58 pounds of aluminum per car, indicates that total consumption of the light metal during the current model year will be more than 283,000,000 pounds.

The 51-pounds-plus figure, developed by Aluminum Co. of America's commercial research division, reflects finished part weights only and continues a 10-year upward trend in automotive use of aluminum, Alcoa said. Total weight of the bright metal sold to auto makers during the past five years tops one-billion pounds.

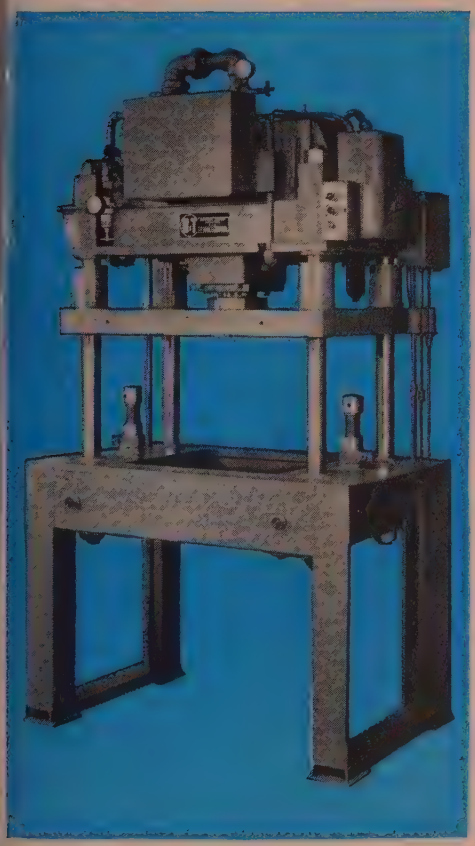
"Our authoritative estimate, while more conservative than some other published predictions, still evidences that the light metal usage at 51.5 pounds per car will break the best previous record (1958) by 9%," Alcoa said. "Our own market analysts had predicted a higher figure for 1958. It fell short because the '58 model mix did not reach industry expectations of high production in passenger car types utilizing over 60 pounds of aluminum per unit."

The 47-pound 1958 actual average represents a final revision of Alcoa's preliminary 52-pound estimate made public a year ago; Alcoa further explained that "data compiled by our research people on per-car usage of aluminum represent a weighted average arrived at by including in calculations estimated proportions of total production for individual makes, based on the '58 model mix.

However, total aluminum consumption in passenger cars would boost the 283-million pounds figure if replacement parts (reckoned at six pounds of aluminum per car during its life) were included, Alcoa pointed out. The artful array of aluminum components for Chrysler's Imperial shown above adds up to 99.67 pounds, tops in the industry



*A Winning Combination!



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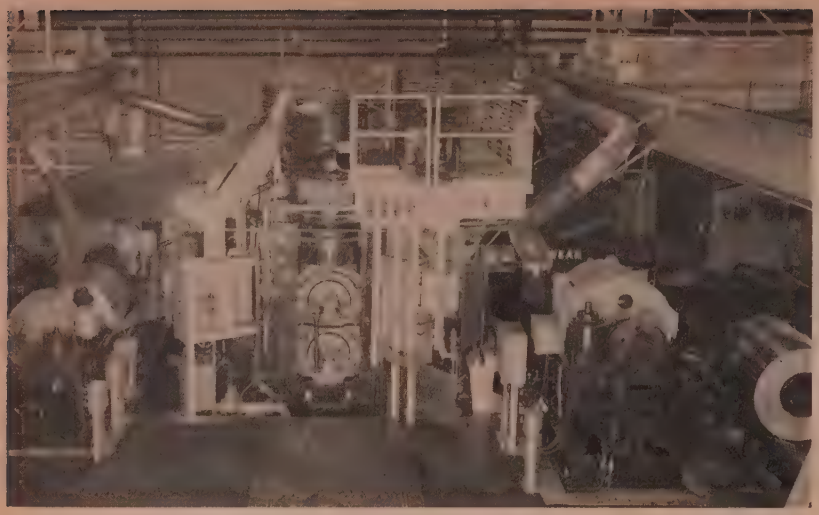

Reynolds Installs Bright Mill; Plans 'Biggest' Hot Mill

A new 66-inch bright mill with the latest refinements for high speed cold rolling of aluminum sheet has been installed at the Reynolds Metals Co. plant near Sheffield, Ala., as part of the plant's $65 million modernization program.

The two-high, single stand cold mill was designed and built by E. W. Bliss Co., and is the first of its kind to be installed by Reynolds.

With a maximum speed of 1000 ft. per minute, the new mill can reduce sheet thickness approximately 50%. It can handle gauges of from .10 to .006 inch. Maximum strip input width is 63 inches. Work rolls are 36 inches in diameter powered by a 1250 HP Westinghouse electric motor.

The mill has such features as a continuous line-flow filtering process to insure clean coolant at all times, and a specially designed heating system that solves the problem of maintaining proper shape of the work rolls. A similar system pre-heats rolls in an adjacent storage area, eliminating the need for pre-production "warm-up" after a roll change.

Electronic controls that report to the control panel permit the mill operator to spot operational difficulties. Other controls maintain gauge consistency in high speed acceleration and deceleration.

Other phases of the expansion program will be installation of what Reynolds terms the "world's largest aluminum hot rolling mill," and new heavy blanking presses.

Koehring Buys Cast-Master

The Koehring Co., 1701 W. Wisconsin Ave., Milwaukee 1, Wis., has purchased Cast-Master, Inc., of Bedford, Ohio, manufacturer of equipment used in casting of aluminum, magnesium and zinc base alloys for the automotive, appliance, electrical and small internal combustion engine industries.

Koehring's Hydraulic Press Mfg. Division currently manufactures hydraulic presses, plastic injection molding machines and dieing machines. Six other divisions in the U. S. and one Canadian

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SWINDELL-DRESSLER CAR BOTTOM FURNACES

High-velocity recirculation of Swindell-Dressler furnace design assures maximum heat utilization in homogenizing ingots uniformly, in minimum firing time. Economical, compact, space-saving construction with low maintenance and long life. Gas or electric heat. *Write for the details.*

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diary of Koehring Co. make con-
tion equipment.
urrent plans call for continued op-
ion of Cast-Master in its leased
t at Bedford as a division of Koeh-
's Hydraulic Press Mfg. Division.
ence E. Taylor, president of the
pany, and Howard P. Miller, secre-
-treasurer, will join the Koehring
anization.
urchase of Cast-Master involved ex-
nge of stock in excess of $1,500,000,
ording to J. R. Steelman, president
Koehring.
Cast-Master, organized in 1937, re-
tly completed a new plant with
000 sq. ft. of manufacturing facilities
l 4400 sq. ft. of office space. Current
ployment is 150.

Magnesium Scaffold Is Light, Durable

One man can assemble and carry a 52-lb. scaffolding unit made of magnesium by White Metal Rolling & Stamping Corp., 82 Moultrie St., Brooklyn, N.Y. The basic unit, which is 9 ft. high not including guard rail, can withstand 600 lbs. of distributed weight, according to White Metal.

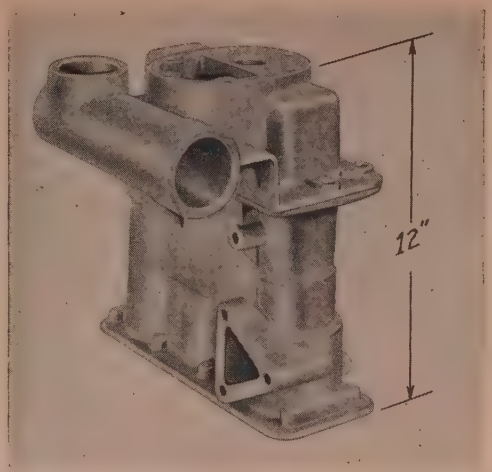
The unit consists of two 6-ft. end sections, two 3-ft. end sections, four cross braces, two outriggers, one guard rail with two posts, and a combination platform plank-ladder which can be used in assembling the other pieces. Flanged tubular sections and guard rails interlock on a sleeve tube in pyramiding construction.

Additional units can be connected laterally. The rubber padded feet are adjustable for uneven levels.

11,000-Ton Smelter Doubles India's Aluminum Capacity

The primary aluminum production capacity of India has been more than doubled by the opening earlier this month of a new smelter by Indian Aluminium Co., Ltd.

Dr. Harekrushna Mahtab, Chief Min-



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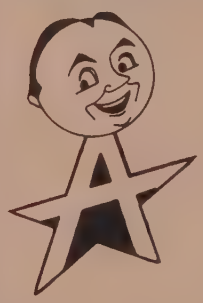

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ister of the State of Orissa, officiated at the opening of the smelter, which has an annual capacity of 11,200 tons of aluminum. Aluminium Limited, large Canadian producer, has a 61% interest in the Indian company and the remainder is held by approximately 3000 Indian shareholders.

Built at a cost of $10 million, the smelter forms part of a $30 million integrated expansion project involving bauxite, alumina, smelting and fabrication of aluminum. Establishment of smelting capacity at Hirakud is based on electric power from the state-owned 165,000 hp Hirakud generating plant, and an expansion of the existing bauxite and alumina facilities in Bihar.

The Indian company has under consideration plans to expand the Hirakud smelter to 22,400 tons capacity, and discussions are currently taking place with the Orissa government for the supply of additional power. Partial expansion of the bauxite-alumina facilities has been completed, and further expansion would be undertaken concurrently with the smelter expansion to meet the full requirements of the Hirakud smelter as well as the company's older 6500-ton smelter in Kerala State.

The Hirakud hydroelectric project on the Mahanadi River is one of India's major new developments, involving a dam three miles long and providing flood control and irrigation as well as power for industrial growth.

The Indian Aluminium Company, established in 1938, has been a fully integrated enterprise for several years. It operates substantial fabricating facilities in Calcutta, Bombay, and Kerala State.

New Radar Target Helps Locate Small Craft

An aluminum radar target makes small boats look bigger on radar screens and thus facilitates their rescue if lost. It also safeguards yachtsmen from being run down by larger ships at night or when fog and rain cut visibility.

The target, manufactured from Reynolds aluminum by Elk Enterprises, Inc., Baltimore, Md., reflects radar beams seven miles directly back to the transmitter, regardless of direction. It causes a bright and distinct pip on the screen of any radar set in a plane or ship.

Even small wooden boats, which otherwise do not reflect radar waves, acquire bright radar visibility with the target. It can be hung from a mast or spar or inside a wooden boat.

When not in use, the Elk radar target folds into a compact 18 by 18 by ¼-inch space.

Titanium Anodizing Racks Adjust to Any Part

All-titanium anodizing racks that can be quickly revised to accommodate wide variations in sizes or shapes of work are made by Anodizing Rack Division, Service Screw Products Co., 133A N. Green St., Chicago 7, Ill. The racks are adjustable from .001 inch to 3 inches.

A new rigid titanium spline and disc-type titanium workholders fitted with integral clamps accomplish rapid changeovers. Workholders can be quickly positioned at any desired location on the spline, and an almost unlimited variety of parts can be racked on the available disc types.

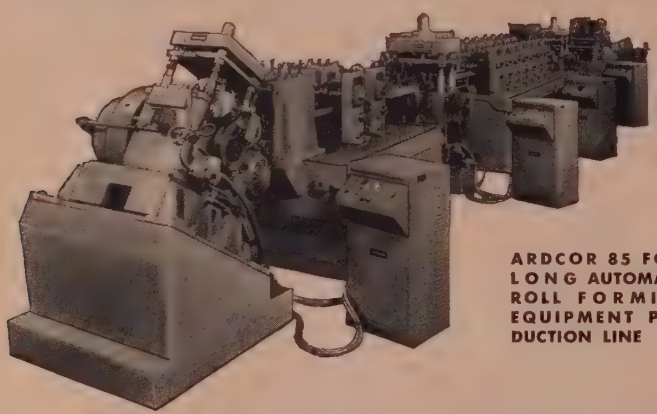
Titanium construction of the racks requires no coating, assures long rack life and eliminates the stripping operation.

"Rejects are reduced to the absolute minimum when the new anodizing rack system is used, and rack maintenance and repairs are practically eliminated," a company spokesman said.

High Speed Roll Forming . . . TIMED IN SECONDS

Upper and lower Seat Tracks completely roll formed, pierced and coiled 1½ feet in length; .078 and .106 gauge steels.

. . . UP TO 45 SEAT TRACKS PER MINUTE, Roll Formed, Pierced, Coiled and Cutoff on this ARDCOR Completely Automated Production Line



ARDCOR 85 FOOT LONG AUTOMATED ROLL FORMING EQUIPMENT PRODUCTION LINE

ARDCOR Roll Forming Equipment, now used by one of America's leading Automotive Manufacturers, for roll forming Upper and Lower Seat Tracks for 1959 model cars.

Starting from the coil box (in the background of the photo above), the stock travels at high speed through a succession of operations including Leveller, First Pre-Notcher, Forming Mill Passes, Second Pre-Notcher, Two-Drive Coiling Fixture, to the Cutoff Press shown in the foreground. Four Pulpit Control Stands are located at the two Pre-Notching Stations, Forming Mill, and Cutoff Press, giving the operators completely automated or emergency control at every station.

Throughout the metal working industry, modern roll forming methods are giving faster production with new and important economies. Let ARDCOR standard or special design Roll Forming Equipment introduce these new improved production advantages in your plant.

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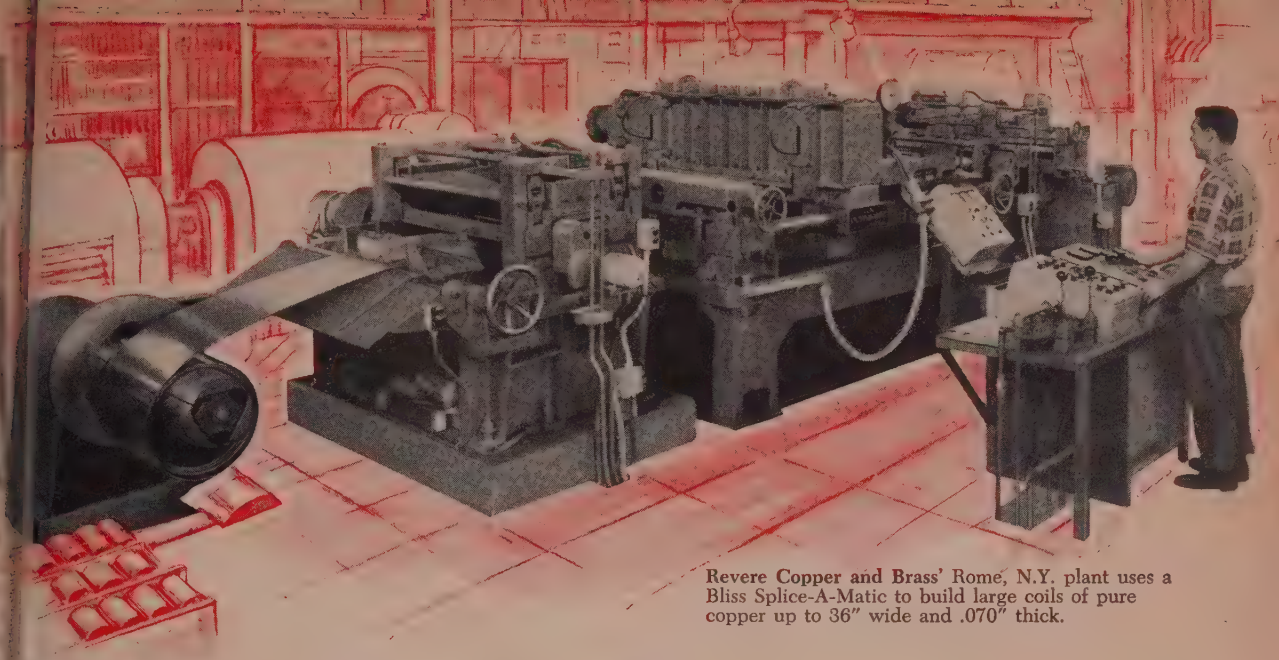

Revere Copper and Brass' Rome, N.Y. plant uses a Bliss Splice-A-Matic to build large coils of pure copper up to 36" wide and .070" thick.

How much could these machines reduce your coil handling costs?

Substantially, if your requirements are at all similar to those of Universal-Cyclops Steel Corporation or Revere Copper and Brass. Universal-Cyclops uses a Bliss Splice-A-Matic welder to cut handling costs in welding carbon and stainless steels, getting ideal welds in even the 300 series.

Revere Copper and Brass uses *its* Splice-A-Matic to build up the larger coils preferred by many of its customers . . . now also finds that these larger coils cut down-time and set-up time in its own subsequent operations.

Just about any weldable material and coil size is practical with the Bliss Splice-A-Matic. It's been used on most alloys in widths to 60" and with both coils and cut-to-length sheets. And complementing the Splice-A-Matic, Bliss offers a complete line of annealers, trimmers, pinch roll stands, levelers, reels, and other units to form a complete, modern coil build-up line.

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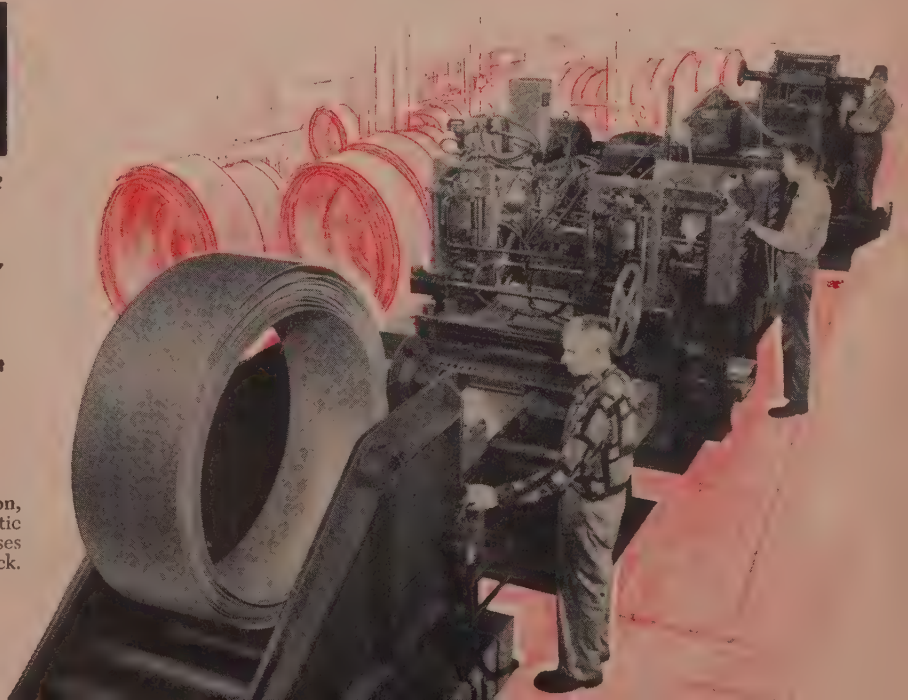
Salem, Ohio

Subsidiary: The Matteson Equipment Company, Inc., Poland, Ohio



At Universal-Cyclops Steel Corporation, Bridgeville, Pa., a Splice-A-Matic successfully welds 300 Series stainlesses 18½" wide and 0.135" to 0.195" thick.

Weighing the Difference

Aluminum Co. of America asked a 115-lb. model to attempt to balance a traditional iron engine block with her weight in order to demonstrate the lightness of the company's most recent aluminum automotive applications.

The aluminum engine block, which weighs only 90 pounds, and model failed to balance the iron unit's 220 pounds.

Canadian Railroad Gets Five Aluminum Reefers

Five refrigerator cars, believed to be the first made almost entirely of aluminum, are now in service with the Canadian National Railways. They were designed by the C.N.R., Aluminum Co. of Canada, Limited—principal subsidiary of Aluminium Limited – and National Steel Car, and built by the latter. They are 22.5% lighter than previous reefers and each saves 14,200 pounds of weight.

With the exception of the trucks, charcoal heater, door and hatch hardware, and certain safety equipment, all parts of these five cars are made of aluminum to minimize repairs and repainting due to corrosion by brine solution. The roof, sides and ends of the cars have been left unpainted. A reduction of over seven tons in the weight of each car will reduce rolling resistance and cut operating cost.

In Canada, the U. S. and Germany, aluminum has been used previously for the roofs, interior and, in one experimental case, outside sheets of the car.

The five prototypes will be extensively tested. Four cars now in service with the C.N.R. are being closely watched in normal service conditions. The fifth was equipped with strain gauges during construction for a static road test. Strain gauge readings and deflections will be recorded for various conditions of road, both on the meat rack and on the floor. This test will be followed by a road test where strain gauge readings will again be recorded to indicate the stress levels encountered on the car during operation.

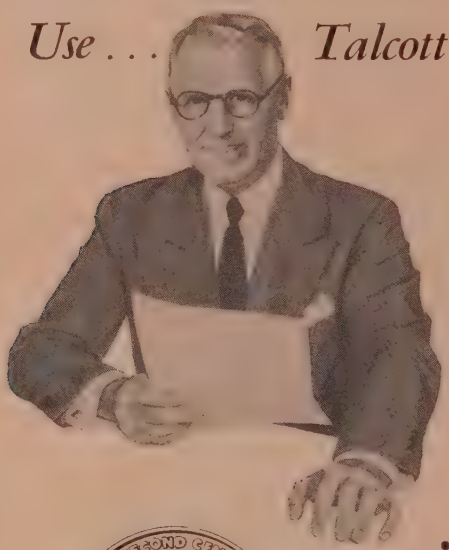
On completion of the road test the car will be sent to Aluminum Laboratories, Limited, Kingston, Ontario, Aluminium Limited's research affiliate, for a fatigue test. The final test will be a series of impact tests.

Test results will be analyzed and compared with the stress analysis which preceded the design. Areas of overdesign and the reverse can be corrected in future cars. This test program, the most extensive carried out in North America, will eliminate the customary five to ten year service testing requirements by the railroads.

Features of the new refrigerator car which are creating wide interest in the North American industry include:

1. All-welded aluminum floor with

Use . . . Talcott's Flexible Financing Plans



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ed inside side sill to facilitate ning.

Aluminum brine tanks equipped drain tubes leading to airtight in traps to feed brine overflow di- ly from car.

. Improved type of aluminum meat .

. Improved insulation due to reflec- ty of aluminum.

. Increased thickness of insulation.

. Composite riveted and welded alu- num underframe.

leliarc Welding hows the Way

Florida tourists are now being guided their destinations by Heliarc welded uminum highway signs. The Florida ate Highway Department recently de- eloped the low-cost signs with assist- nce from the Engineering Service Dept. f Linde Co., 420 Lexington Ave., New ork 17, and Aluminum Co. of America. The Highway Department has suc- essfully fabricated single and multiple gn posts. The "over-the-highway" sign arrier pictured above can be used in ngle or double lengths, depending pon the length of the sign, from 40 o 70 ft.

According to A. L. Rees, engineer or the Florida State Highway Dept., luminum reduced installation and naintenance costs of the signs, which were formerly fabricated from steel by combination welded-bolted design. The aluminum parts are joined by high speed Heliarc welds that require no post-weld finishing. This is a saving n itself.

Signs are fabricated from pre-cut parts made of alloy 6061 3-in. thick channel, 3/32 to 3/6-in. thick plate, and 1½- to 6-in. diameter tubing. Heliarc HW-17 torches are used on material up to ⅛-in. thick, while Heliarc HW-12 torches are used for heavier work. Ox-weld No. 23 aluminum rod is used to make all welds, all of which are shielded from contamination by argon.

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Extruded Skin Covers Giant Titan Missile

Titan, considered one of the world's most advanced ICBM weapon systems, is the first missile of this type having an aluminum skin. The huge missile can deliver a warhead "with great accuracy" to targets more than 6000 miles from its launching pad.

Walls of the propellant tanks in the Titan also form the missile's outer skin, becoming an integral part of the air frame. They are fabricated from large extrusions produced on the 14,000-ton press at Alcoa's Lafayette, Ind. works.

The accompanying photo shows one of the extruded shapes emerging from the press as an inverted vee. These 20-ft.-long shapes are then flattened into 34-in. widths and shipped to the Martin Co.'s Denver Division for stretch-forming, chemical milling, and welding.

Titan blasts through the earth's atmosphere on its first stage rocket power. In frictionless space the missile's second engine accelerates the nose cone to about 16,000 mph, at which the engine will cut out. Then the warhead coasts in a great curving path, reaching a height of 700 miles before plunging to its target.

Two New Rolling Mills To Produce Foil

The Pittsburgh Engineering and Machine Division of Pittsburgh Steel Foundry Corp., Glassport, Pa., has received an order for two 64-inch 4-Hi aluminum foil mills from Anaconda Aluminum Corp., subsidiary of Anaconda Co.

The order represents a part of the $2 million expansion program to increase production of aluminum foil at the former Cochran Foil plant in Louisville, Ky.

The mills will include a hydraulically operated roll stand to control roll pressure, a direct drive to permit variable work roll diameters ideal for foil and

ch, and X-ray equipment for auto-
ic gauge control," Albert C. Fisher,
president of Pittsburgh Engineer-
reported.
oil will be rolled at a speed of 2000
per minute with a minimum thick-
s of .0002 inch and a maximum
th of 54 inches. The mills are sched-
d for operation early next Septem-

isher, who recently made a study
markets and production facilities in
aluminum industry, said there are
lications that a considerable invest-
nt will be made in additional rolling
ll equipment for the foil industry in
next eight to ten years to attain an
nual production of five to six million
ns as compared to today's production
slightly over two million tons.

eed Planter Utilizes Aluminum Foil Box

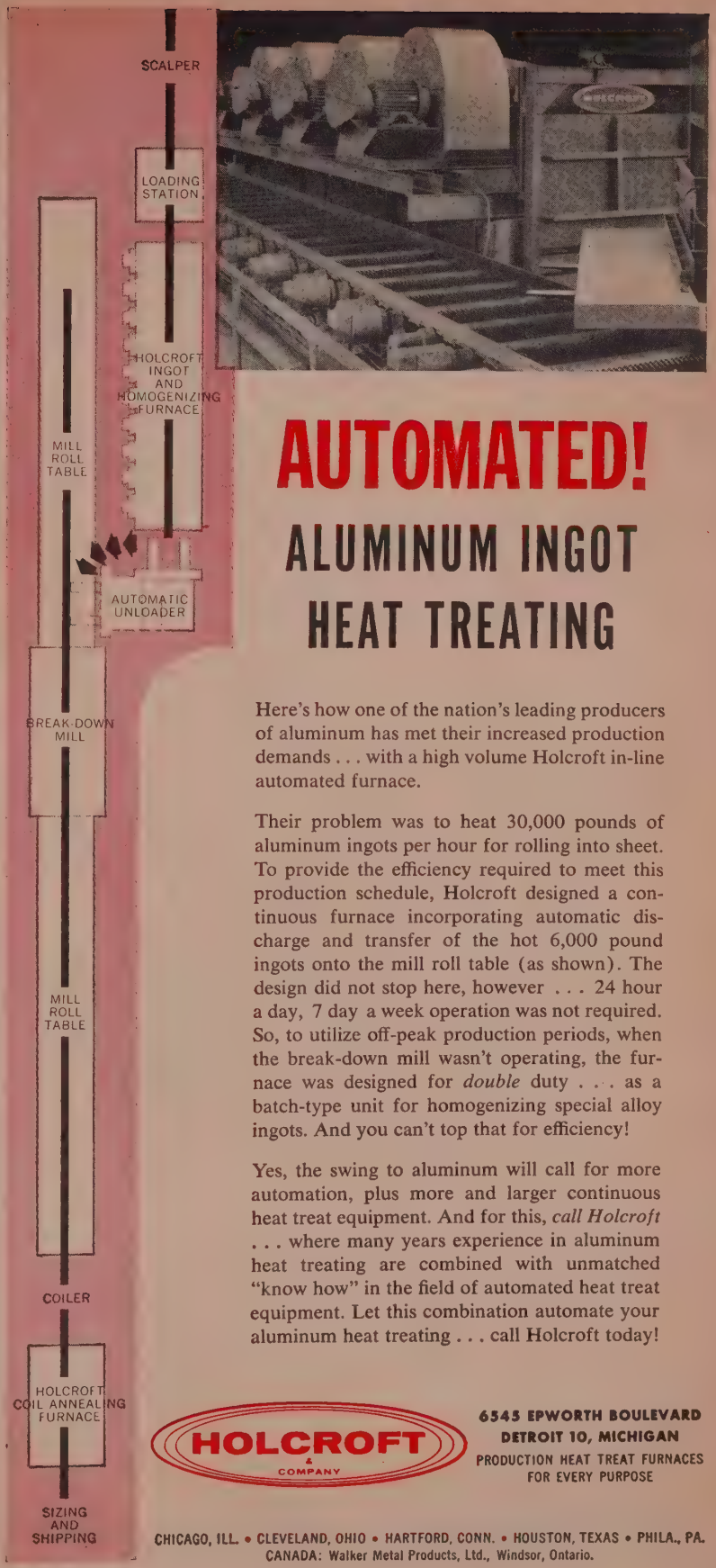
Gold finish aluminum foil forms an ttractive container for seed starters hat grow on a window sill into a va-ity of flowers or vegetable plants. Benton-Kirby, Inc., 445 N. Broadway, Milwaukee, Wis., manufactures the new planter package sold under the name, Sure Sprout Seed Starters. The aluminum foil planters are supplied by Ekco-Alcoa Containers Inc., Wheeling, Ill.

Seeds are planted in synthetic growing material. Water, added as directed, starts seed growth and will not soak through aluminum planter. The seed starters enable gardeners to have plants weeks before the normal growing season.

New Alloy Offers Higher Luster, More Workability

Aluminum Co. of America reports that a new aluminum alloy, X5557, makes possible lustrous anodized finishes and provides more workability than ever before.

F. J. Close, Alcoa vice president and general manager of sales development and commercial research, said that sheet fabricated from the new alloy should



AUTOMATED!

ALUMINUM INGOT HEAT TREATING

Here's how one of the nation's leading producers of aluminum has met their increased production demands . . . with a high volume Holcroft in-line automated furnace.

Their problem was to heat 30,000 pounds of aluminum ingots per hour for rolling into sheet. To provide the efficiency required to meet this production schedule, Holcroft designed a continuous furnace incorporating automatic discharge and transfer of the hot 6,000 pound ingots onto the mill roll table (as shown). The design did not stop here, however . . . 24 hour a day, 7 day a week operation was not required. So, to utilize off-peak production periods, when the break-down mill wasn't operating, the furnace was designed for *double* duty . . . as a batch-type unit for homogenizing special alloy ingots. And you can't top that for efficiency!

Yes, the swing to aluminum will call for more automation, plus more and larger continuous heat treat equipment. And for this, *call Holcroft* . . . where many years experience in aluminum heat treating are combined with unmatched "know how" in the field of automated heat treat equipment. Let this combination automate your aluminum heat treating . . . call Holcroft today!

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CANADA: Walker Metal Products, Ltd., Windsor, Ontario.

find wide application in the automotive, appliance, and architectural markets.

"The new sheet alloy is excellent in combination with Alcoa's high-luster extrusion alloy, X6463, and bright sheet alloys 5357 and X5457," Close added. "Its bright, chrome-like finish after polishing, brightening and anodizing possesses excellent resistance to corrosion."

The alloy comes in coiled or flat sheet and plate, as well as circles and blanks. It can be supplied in mill finish, and one-side bright mill finish, and in all thicknesses and widths currently available to the auto and appliance trades.

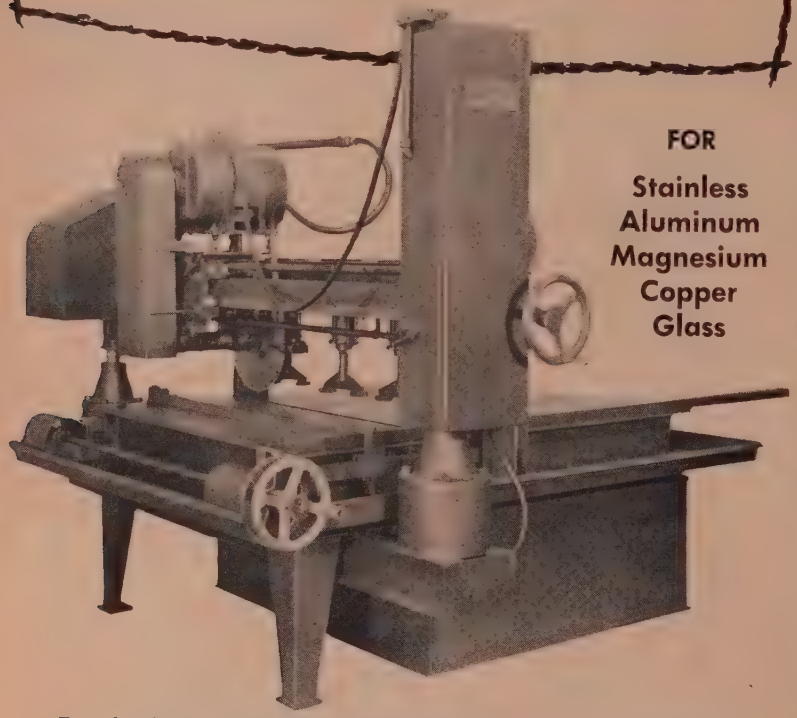
Wrought Magnesium Shipments Gain; Output Drops

Year-end figures released by the Magnesium Association show that primary magnesium ingot production was down by 62% to 30,096 tons from 1957 production of 78,865 tons. At the same time, shipments of wrought magnesium products were off only 15% with a total of 9.343 tons as contrasted with 1957 shipments of 10,959 tons.

The condition these figures reflect is not undesirable, the Association states. Wrought product shipments have shown a continual up trend and the average monthly shipments for the year are well above the average for the last half of 1957 when shipments fell below 600 tons in one month. It is generally recognized that the low production of primary reflects the determination of The Dow Chemical Co. to reduce inventory.

Additional figures indicate that shipments of wrought products were 4,12[illegible] tons for the second half '57, increasing to 4,282 tons for the first half '58 and to 5,061 tons for the second half '58, while primary ingot production for the second half of '57 (37,599 tons) decreased to 19,058 tons for the first half of '58 and 11,038 tons for the second half of '58.

Precision Saw With Air Clamps Makes Clean Cuts..Reduces Waste & Machining



FOR

Stainless
Aluminum
Magnesium
Copper
Glass

Rough edges left from shearing and inaccurate saws pile up needless machining bills . . . plus the cost of wasted metal. With this new Ty-Sa-Man 144-BD Saw, adjustable air clamps hold metal down while the saw travels down the machined transverse rail, delivering cuts with smooth edges to amazing tolerances. Cut parallel strips . . . handle difficult jig fixture work with this self-contained saw which has its own integral cooling system and tank. Among its features are a calibrated guide fence, infinite variable speed from zero to twenty FPM, push-button control and 15 HP motor.

Ty-Sa-Man
SINCE 1885

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TY-SA-MAN Machine Co., Inc.

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Men-on-the-move

Vern Ammerman, vice president of Pioneer Aluminum Inc., Los Angeles, assumes added administrative responsibilities, created by the firm's rapid growth, as merchandising manager. Paul Kirk, president of Pioneer and of the parent company, Morris P. Kirk & Son, Inc., also announced the appointment of **William F. Morrow** as general sales manager. Pioneer, a leading distributor of aircraft extrusions, has recently added aluminum sheet and bar, stainless steel, and fasteners to its line.

Austin R. Zender, president of Bridgeport Brass Co., has assumed the post of chief executive and general manager relinquished by Herman W. Steinkraus. Steinkraus continues as board chairman.

Reynolds Metals Co. has placed **Irving Lipkowitz** in charge of a newly created post, director of economic affairs. He will conduct studies in the areas of competition and world trade, according to president Richard S. Reynolds. Lipkowitz joined Reynolds in January 1947 as economic advisor to R. S. Reynolds, Sr., founder of the firm. Since 1949 he has served as assistant to the president and director of economic research. He is also a director of the Aluminum Association and represents Reynolds in other associations.

Bohn Aluminum & Brass Corp., Detroit, announced the following advancements of officers: **Simon D. Den Uyl,** formerly president, was elected chairman of the board. **Terry W. Kuhn,** formerly executive vice president, is now president. **Richard C. Aylward,** general sales manager, became vice president sales. **H. Blake Thomas,** general manager of the Betz Division, was elected vice president. The directors also elected a new board member; he is **Guy E. Pitts,** vice president-manufacturing.

William H. Slemp, Jr., former ma[illegible]

g director for the National Associa-
of Home Builders, has been named
aiser Aluminum & Chemical Sales,
to direct its expanded marketing
s in the residential building field.
will develop and coordinate pro-
s for selling aluminum products to
residential field, with emphasis
d on the products of Kaiser Alu-
m's customers. New product de-
oment will be another phase of
luties. His title is manager of resi-
ial building sales.

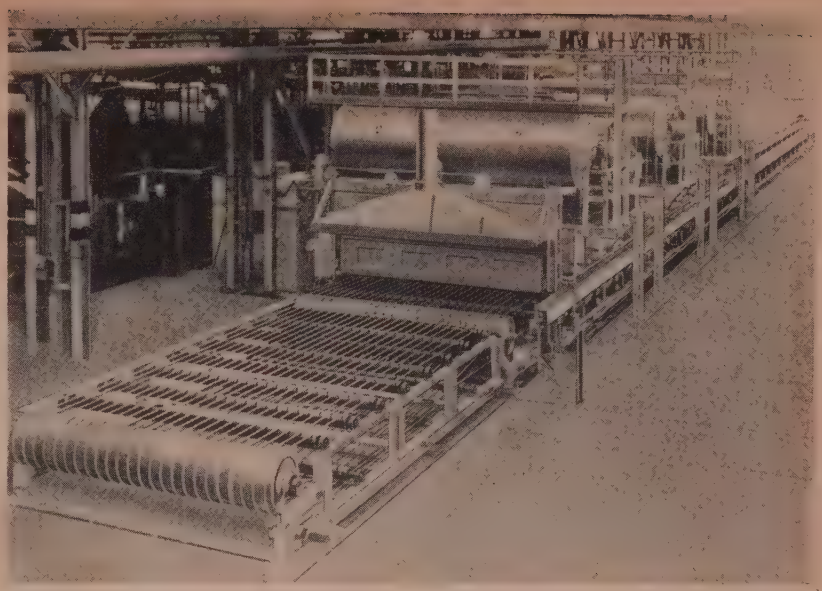
iminum Scale
ds Into Wall

n aluminum scale that can be built
unused wall space in bathroom,
room or hallway is manufactured
Nutone, Inc., Madison and Red
k Roads, Cincinnati 27, Ohio. The
e is 16¼ in. by 25¼ in., and weighs
lbs.

fingertip control spring action door
mits the scale to fold down from
l for quick use and fold back to
floor space.

bright finish on the scale is achieved
using Nutone's F#5 brightener solu-
n. The satin finish is clear anodized
er a brushing operation.

The outer shell is drawn and the
or is formed. Other aluminum com-
nents are stampings.



Conveyor Furnace Saves Finish on Sheet Up to 12 Feet Wide

Aluminum products and sheets up to 144 inches wide will be annealed in two furnaces having a new type of band conveyor at Reynolds Metals Co.'s Listerhill, Ala. plant. Rust Furnace Co., 930 Fort Duquesne Blvd., Pittsburgh, built the units.

Shown in the photo is the charging end of the sheet annealing furnace with the new type band conveyor which is designed to minimize marking of the aluminum sheets.

Individually tensioned stainless steel bands are spaced to accommodate a variety of sizes and shapes of aluminum products for the automotive and appliance fields. Overall length is 175 feet; inside width is 12 feet.

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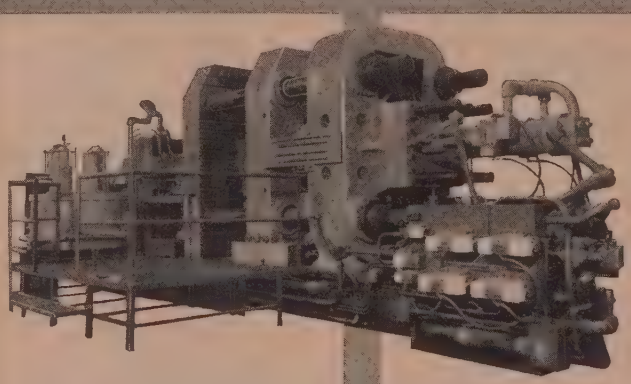

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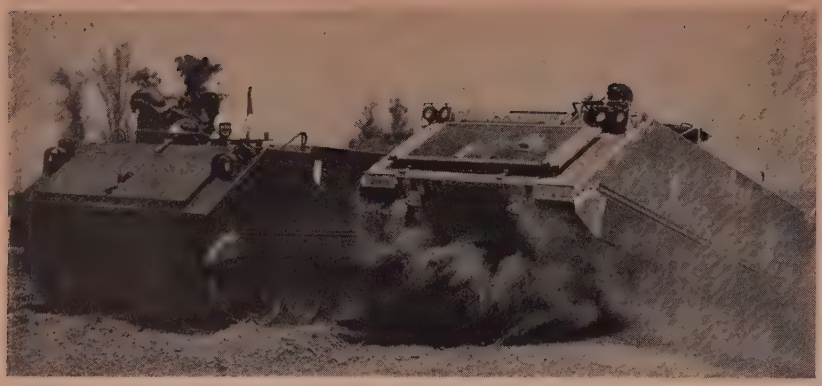

Aluminum Armor Plate Lightens Troop Carrier

Pilot models of new U. S. Army personnel carriers having aluminum armor plate instead of steel are being given final field tests.

The aluminum plating on the T-113 (shown right in photo) permits better air transport of the 13-man tracked vehicles and more economical fuel consumption, while granting through extra thickness ballastic protection equivalent to the larger M59s, present steel armored troop carriers (shown on left).

The T-113, a part of the Army's modernization program to achieve greater land, air and water mobility, can also traverse inland waterways. It was designed in two types—the T-113 E1 and T-113 E2.

The latter has greater weight and armor. Either type can mount one 30 or 50 caliber machine gun. The manufacturer is the Ordnance Division of Food Machinery & Chemical Corp., San Jose 6, Calif., who also designed the vehicle.

The manufacturer used the high strength weldable aluminum alloy, 5083, developed by Kaiser Aluminum, for the thick plate sections. The carrier's power plant and other parts are also made of aluminum.

The $1.5 million contract with Food Machinery for production of the T-113 culminated two years of design and engineering work at San Jose. The contract stipulated that the T-113s be "economical to produce, effective in operation, easy to maintain and feature producibility and minimum critical material usage."

While the T-113 was designed primarily to provide the infantry with armor-protected battlefield mobility, it can also be used as a rocket launcher, a self-propelled weapons carrier, a mortar carrier, an anti-tank missile carrier, ambulance, communications vehicle, command post vehicle, cargo carrier, and fire direction center.

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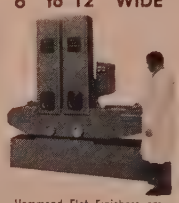

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Send us one finished and several rough samples. You will receive a complete Engineering Report and Production Analysis without obligation.

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Process Relieves Thermal Stress in Irregular Parts

A process that promises to expand greatly the range of stress relieved aluminum alloy products available to industry has been developed by Aluminum Co. of America, Alcoa Building, Pittsburgh 19, Pa.

Stresses develop within aluminum shapes as they are quenched after heat treatment to increase strength. When unbalanced by subsequent machining, the stresses can warp and twist parts out of contour. This problem, common with all metals, is most easily solved by reducing stresses prior to machining.

For irregularly shaped products that cannot be handled by standard methods, Alcoa research engineers have developed a thermo-mechanical procedure that substantially reduces internal stresses by superimposing a system of thermal gradients opposite to those which created the stresses during the quenching operation.

Chief value of the new method will be in providing complex, fully heat treated aluminum shapes — particularly die forgings — with low internal stresses. Mechanical properties remain essentially unchanged. Sample shapes processed by the thermo-mechanical procedure have approximately the same low level of internal stresses achieved by mechanical stress relieving methods.

Where to buy... MATERIALS EQUIPMENT SERVICES for the Light Metals Industr

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orrance, Calif.
l Extrusions, Inc.
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ast Rochester, New York
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hicago 11, Ill.
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00 Park Avenue
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Chicago 11, Ill.
Olin Aluminum
400 Park Ave.
New York 22, N. Y.
Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky
Wolverine Tube
Div. of Calumet & Hecla, Inc.
17200 Southfield Rd.
Allen Park, Mich.

BILLET, MAGNESIUM
Dominion Magnesium, Ltd.
320 Bay Street
Toronto, Ont., Canada
The Dow Chemical Company
Magnesium Department
Midland, Michigan

BILLET, TITANIUM
Harvey Aluminum
Torrance, Calif.

BILLET, ZIRCONIUM
Harvey Aluminum
Torrance, Calif.

BRAZING SALTS, ALUMINUM
Park Chemical Co.
8074 Military Ave.
Detroit 4, Mich.

BUS CONDUCTOR, ALUMINUM
Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania
Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.
Harvey Aluminum
Torrance, Calif.
Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.
Olin Aluminum
400 Park Avenue
New York 22, N. Y.
Precision Extrusions, Inc.
721 East Green Street
Bensenville, Illinois
Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.
Reynolds Metals Company
2500 South Third Street
Louisville 1, Kentucky

CASTINGS, ALUMINUM DIE
Alpha Industries, Inc.
615 Center Ave.
Logansport, Ind.
Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.
Federal Die Casting Company
2226 North Elston
Chicago, Illinois
Hampden Brass & Aluminum Co.
262 Liberty St.
Springfield, Mass.
Madison-Kipp Corp.
217 Waubesa Street
Madison 4, Wisconsin

CASTINGS, MAGNESIUM DIE
Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania
The Dow Chemical Company
Magnesium Department
Midland, Michigan

CASTINGS, ALUMINUM, SAND AND PERMANENT MOLD
Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)
A. C. Williams Co.
Ravenna, Ohio

CASTINGS, MAGNESIUM, SAND AND PERMANENT MOLD
Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.
Dominion Magnesium, Ltd.
320 Bay Street
Toronto, Ont., Canada
The Dow Chemical Company
Magnesium Department
Midland, Michigan
A. C. Williams Co.
Ravenna, Ohio

CASTINGS, ZIRCONIUM
Harvey Aluminum
Torrance, Calif.

CIRCLES, ALUMINUM
Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.
Fairmont Aluminum Co.
Fairmont, W. Va.
Kaiser Aluminum & Chemical Corp.
919 No. Michigan Ave.
Chicago 11, Ill.

CLEANERS, ALUMINUM
Frederick Gumm Chemical Co.
538 Forest St.
Kearny, New Jersey
Hanson-Van Winkle-Munning Co.
Matawan, N. J.
MacDermid Inc.
Waterbury 20, Conn.
Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.
Oakite Products, Inc.
50A Rector Street
New York 6, N. Y.
Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.
Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

CLEANERS, ALUMINUM SURFACE
Amchem Products, Inc.
Ambler 12, Pennsylvania
Hanson-Van Winkle-Munning Co.
Matawan, N. J.
Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.
Oakite Products, Inc.
50A Rector Street
New York 6, New York
Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.
Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.
Turco Products, Incorporated
6135 S. Central Ave.
Los Angeles 1, California

COATINGS, ELECTRICALLY CONDUCTIVE
American Charcoal Co.
201 S. Green St.
Detroit 17, Mich.
Graphite Products Corp.
Brookfield, Ohio

COIL, ALUMINUM
Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York
Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.
Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.
Chase Brass & Copper Co.
Waterbury 20, Conn.
Fairmont Aluminum Company
Fairmont, West Virginia
Johnston Foil Div.
Standard Packaging Corp.
6008 S. Broadway
St. Louis 11, Mo.
Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.
Nichols Wire & Aluminum Co.
Davenport, Iowa
Olin Aluminum
400 Park Avenue
New York 22, N. Y.

(Coil, Aluminum—continued)

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Connecticut

Sheet Aluminum Corp.
701 Liberty St.
Jackson, Mich.

COILS, PRE-ANODIZED

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

COILS, PRE-PAINTED

Bridgeport Brass Co.
Aluminum Division
Bridgeport 2, Conn.

Coated Materials Div. COMACO, Inc.
P. O. Box 9536
Pittsburgh 23, Pa.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Aluminum Supply Co.
573 W. Peachtree Street, N.E.
Atlanta, Georgia

Reynolds Metals Company
2500 South Third Street
Louisville 1, Kentucky

COMPOUNDS, BARREL FINISHING

MacDermid Inc.
Waterbury 20, Conn.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

CONVERSION COATING FOR ALUMINUM

Amchem Products, Inc.
Ambler 12, Pa.

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

DETERGENTS

MacDermid Inc.
Waterbury 20, Conn.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

Turco Products Incorporated
6135 South Central Avenue
Los Angeles 1, California

DIE STEELS FOR DIE CASTING

Latrobe Steel Co.
Latrobe, Pa.

DIE STEEL, EXTRUSION

Latrobe Steel Co.
Latrobe, Pa.

DISPERSIONS, COLLOIDAL-GRAPHITE

American Charcoal Co.
201 S. Green St.
Detroit 17, Mich.

Grafo Colloids Co.
259 Wilkes Pl.
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

DISTRIBUTORS & JOBBERS (Al)

These firms handle aluminum sheet, plate, coils, rolled shapes, rod, bar, tubing, wire, etc.

Aluminum Distributors, Inc.
7301 W. Harrison Street
Forest Park, Illinois

Aluminum Mill Supply Corp.
42-44 Court Street
Brooklyn 1, N. Y.

Aluminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

Atlantic Aluminum & Metal Distributors, Inc.
Page Boulevard
Springfield, Massachusetts

Chase Brass & Copper Co.
Waterbury 20, Conn.

Peter A. Frasse and Company
17 Grand Street
New York, N. Y.

General Materials Co.
1400 Plaza Ave.
New Hyde Pk., N. Y.

International Selling Corp
122 East 42nd St.
New York 17, New York

J & L Steel Warehouse Div.
545 W. McCarty
Indianapolis 5, Ind.

E. M. Jorgensen Company
10650 South Alameda
Los Angeles, California

Perry Kilsby, Inc.
2501 S. Malt Ave.
Los Angeles 22, Calif.

Precision Steel Warehouse, Inc.
3500 North Wolf Road
Franklin Park, Illinois

Production Metals, Inc.
299 Pavonia Ave.
Jersey City 2, N. J.

Reynolds Aluminum Supply Co.
573 W. Peachtree Street, N.E.
Atlanta, Georgia

Joseph T. Ryerson & Son, Inc.
16th and Rockwell Streets
Chicago 80, Illinois

DRAWING COMPOUNDS, METAL AND WIRE

American Charcoal Co.
201 S. Green St.
Detroit 17, Mich.

Graphite Products Corp.
Brookfield, Ohio

ELECTRODES FOR WELDING

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

Kaiser Aluminum & Chemical Corp.
919 No. Michigan Ave.
Chicago 11, Ill.

Metal and Thermit Corp.
Rahway, New Jersey

ENAMELS, PORCELAIN ALUMINUM

Ferro Corporation
4150 E. 56th St.
Cleveland 5, Ohio

ETCHANT, ALUMINUM

Frederick Gumm Chemical Co.
538 Forest St.
Kearny, N. J.

MacDermid Inc.
Waterbury 20, Conn.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

EXTRUSIONS, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Wm. L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Jarl Extrusions, Inc.
Linden Avenue
East Rochester, New York

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

National Impacted Metal Corp.
P. O. Box 151
New Albany, Miss.

Olin Aluminum
400 Park Avenue
New York 22, New York

Precision Extrusions, Inc.
721 East Green Street
Bensenville, Illinois

Revere Copper & Brass, Inc.
230 Park Avenue
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville 1, Kentucky

Southern Extrusions Co.
North Washington Street
Magnolia, Arkansas

Wells Aluminum Corp.
North Liberty, Ind.

R. D. Werner Co., Inc.
Dept. 41
Greenville, Pa.

White Metal Rolling & Stamping
82 Moultrie Street
Brooklyn 22, New York

Wolverine Tube
Div. of Calumet & Hecla, Inc.
17200 Southfield Rd.
Allen Park, Mich.

EXTRUSIONS, IMPACT

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif

Magnesium Co. of America
East Chicago, Indiana (Mg)

National Impacted Metal Corp.
P. O. Box 151
New Albany, Miss.

White Metal Rolling & Stamping
82 Moultrie Street
Brooklyn 22, New York

EXTRUSIONS, IMPACT, MAGNESIUM

National Impacted Metal Corp.
P. O. Box 151
New Albany, Miss.

EXTRUSIONS, IMPACT, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

EXTRUSIONS, MAGNESIUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Dominion Magnesium, Ltd.
320 Bay Street
Toronto, Ont., Canada

The Dow Chemical Company
Magnesium Department
Midland, Michigan

White Metal Rolling & Stamping Corp.
82 Moultrie Street
Brooklyn 22, New York

EXTRUSIONS, TITANIUM

Bridgeport Brass Company
Aluminum Division
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif.

EXTRUSIONS, ZINC, IMPACT

National Impacted Metal Corp.
P. O. Box 151
New Albany, Miss.

EXTRUSIONS, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

FASTENERS, ALUMINUM

Southern Screw Company
Statesville, North Carolina

FENCING, ALUMINUM

Nichols Wire & Aluminum Co.
Davenport, Iowa

FILLER METAL, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

FILLER METAL, MAGNESIUM

All-State Welding Alloys
249-55 Ferris Ave.
White Plains, N. Y.

FINISHES AND COATINGS, ALUMINUM

Amchem Products, Inc.
Ambler 12, Pennsylvania

The Chemical Corporation
54 Waltham Avenue
Springfield 9, Mass.

Conversion Chemical Corp.
101 E. Main St.
Rockville, Conn.

Eastman Chemical Products, Inc.
Kingsport, Tennessee

Frederick Gumm Chemical Co.
538 Forest St.
Kearny, N. J.

MacDermid Inc.
Waterbury 20, Conn.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

Turco Products Incorporated
6135 S. Central Ave.
Los Angeles 1, California

FLUXES, ALUMINUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Smelting & Refining Co.
Maple Heights, Ohio

Apex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

Kaiser Aluminum & Chemical Sales
1924 Broadway
Oakland 12, California

Park Chemical Co.
8074 Military Ave.
Detroit 4, Mich.

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

FLUX, ALUMINUM SOLDERING

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

American Solder & Flux Co.
19th and Willard Sts.
Philadelphia 40, Pa.

FLUX, BRAZING

American Solder & Flux Co.
19th & Willard Sts.
Philadelphia 40, Pa.

FLUX, WELDING

American Solder & Flux Co.
19th & Willard Sts.
Philadelphia 40, Pa.

FLUXES, MAGNESIUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

The Dow Chemical Co.
Magnesium Dept.
Midland, Mich.

FOIL, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Johnston Foil Div.
Standard Packaging Corp.
6008 S. Broadway
St. Louis 11, Mo.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Revere Copper & Brass, Inc.
230 Park Avenue
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

FORGINGS, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

ings, Aluminum—continued

oort Brass Company
rand St.
geport 2, Conn. (Al, Ti)

Aluminum
ance, Calif.

Aluminum & Chemical Sales
No. Michigan Ave.
ago 11, Ill.

Copper & Brass, Inc.
Park Ave.
York 17, N. Y.

lds Metals Company
South Third Street
isville, Kentucky (Al)

n-Gordon Company
rcester 1, Mass. (Al, Mg, Ti)

INGS, COLD, NO-DRAFT

num Company of America
Alcoa Building
sburgh 19, Pennsylvania

eport Brass Company
Grand St.
geport 2, Connecticut

ey Aluminum
rance, Calif.

r Aluminum & Chemical Sales
No. Michigan Ave.
cago 11, Ill.

INGS, EXTRUSION, TOOL

obe Steel Co.
robe, Pa.

INGS, IMPACT

inum Company of America
Alcoa Building
tsburgh 19, Pa.

eport Brass Co.
Grand St.
idgeport 2, Conn.

ey Aluminum
rrance, Calif.

INGS, MAGNESIUM

inum Company of America
7 Alcoa Building
ttsburgh 19, Pennsylvania

geport Brass Co.
minum Division
idgeport 2, Conn.

ey Aluminum
rrance, Calif.

nan-Gordon Company
orcester 1, Mass. (Al, Mg, Ti)

INGS, TITANIUM

minum Company of America
7 Alcoa Building
ttsburgh 19, Pennsylvania

geport Brass Co.
Grand St.
ridgeport 2, Conn.

ey Aluminum
rrance, Calif.

man Gordon Company
Vorcester 1. Mass.

INGS, ZIRCONIUM

rvey Aluminum
rrance, Calif.

IT FOR ALUMINUM

erro Corp.
150 E. 56th St.
leveland 5, Ohio

ARDWARE, DOOR, WINDOW

ke Park Metal Stamping, Inc.
1122 Velma Court
Youngstown, Ohio

AT TREATING SALTS, ALUMINUM

rk Chemical Co.
8074 Military Ave.
Detroit 4, Mich.

INGES, ALUMINUM, ALL TYPES

ke Park Metal Stamping Inc.
1122 Velma Court
Youngstown, Ohio

IGOT, ALUMINUM (ALLOYS)

luminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

luminum & Magnesium, Inc.
Sandusky, Ohio

luminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa

luminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

pex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

ederated Metals Div. ASARCO
120 Broadway
New York 5, N. Y.

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville 1, Kentucky

INGOT, MAGNESIUM (ALLOYS)

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Apex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

Dominion Magnesium, Ltd.
320 Bay Street
Toronto, Ont., Canada

The Dow Chemical Co.
Magnesium Department
Midland, Michigan

INGOT, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

INSERTS, SCREW THREAD

Heli-Coil Corporation
805 Shelter Rock Lane
Danbury, Connecticut

IRRIGATION PIPE, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Olin Aluminum
400 Park Ave.
New York 22. N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville, 1, Kentucky

LUBRICANTS, CASTING

American Charcoal Co.
201 S. Green St.
Detroit 17, Mich.

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

Scott Chemical Corp.
241 West Jefferson
Los Angeles 7, Calif.

LUBRICANTS, EXTRUDING

American Charcoal Co.
201 S. Green St.
Detroit 17, Mich.

Graphite Products Corp.
Brookfield, Ohio

LUBRICANTS, FORGING

American Charcoal Co.
201 S. Green St.
Detroit 17, Mich.

Graphite Products Corp.
Brookfield, Ohio

LUBRICANTS, METALWORKING

American Charcoal Co.
201 S. Green St.
Detroit 17, Mich.

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

Scott Chemical Corp.
241 West Jefferson
Los Angeles 7, Calif.

MAINTENANCE MATERIALS, PAINT SPRAY BOOTH

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

NAILS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

NONFERROUS METALS

Hyman Viener & Sons
5300 Hatcher
Richmond, Va.

NUTS

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

PARTING COMPOUNDS

American Charcoal Co.
201 S. Green St.
Detroit 17, Mich.

Graphite Products Corp.
Brookfield, Ohio

PIG, ALUMINUM

Aluminium Limited Sales, Inc
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

PIPE, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Perry Kilsby Inc.
2501 S. Malt Ave.
Los Angeles 22, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

Wolverine Tube
Div. of Calumet & Hecla, Inc.
17200 Southfield Rd.
Allen Park, Mich.

PLASTIC CAPS, INSERTS FOR TUBULAR FURNITURE

Impex Corp.
4049 Simon Road
Youngstown 12, Ohio

PLASTIC GLIDES, RUNNERS FOR WINDOWS, DOORS, SCREENS

Impex Corp.
4049 Simon Road
Youngstown 12, Ohio

PLATE, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Fairmont Aluminum Company
Fairmont, West Virginia

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Nichols Wire & Aluminum Co.
Rockingham Road
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, New York

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

Sheet Aluminum Corp.
701 Liberty St.
Jackson, Mich.

PLATE, MAGNESIUM

The Dow Chemical Company
Magnesium Department
Midland, Michigan

White Metal Rolling & Stamping
82 Moultrie Street
Brooklyn 22, New York

PLATE, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

POLISHING, CHEMICAL

Alchemize Corporation
1431 South Talman Avenue
Chicago 8, Illinois

MacDermid Inc.
Waterbury 20, Conn.

REFRACTORIES

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

General Refractories Co.
1520 Locust St.
Philadelphia 2, Pa.

H. K. Porter Co., Inc.
Porter Bldg.
Pittsburgh 19, Pa.

RIVETS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

ROD AND BAR, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

ROD, BRAZING

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

ROD, WELDING

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Buildings
Pittsburgh 19, Pennsylvania

American Solder & Flux Co.
19th and Willard Sts.
Philadelphia 40, Pa.

The Dow Chemical Co.
Magnesium Dept.
Midland, Mich.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

SCREEN WIRE, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

SCREWS, MACHINE, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Southern Screw Company
Statesville, North Carolina

SCREWS, TAPPING, ALUMINUM

Southern Screw Company
Statesville, North Carolina

SCREWS, WOOD, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Southern Screw Company
Statesville, North Carolina

SHAPES, ROLL FORMED

Allmetal Weatherstrip Co.
1911 Ridge Ave.
Evanston, Ill.

Hygrade Metal Moulding Mfg. Co.
778 Glenmore Ave.
Brooklyn 8, N. Y.

Nichols Wire & Aluminum Company
Davenport, Iowa

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

Roll Formed Products Co.
3754 Oakwood Avenue
Youngstown, Ohio

Sager Metal Strip Co.
2531 Homer St.
Chicago 47, Ill.

R. D. Werner Co., Inc.
Dept. 41
Greenville, Pa.

SHEET, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

Chase Brass & Copper Co.
Waterbury 20, Conn.

Fairmont Aluminum Company
Fairmont, West Virginia

Johnston Foil Div.
Standard Packaging Corp.
6008 S. Broadway
St. Louis 11, Mo.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, New York

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Conn.

Sheet Aluminum Corp.
701 Liberty St.
Jackson, Mich.

SHEET, ANODIZED

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

City Plating & Polishing Co.
22nd & Cole Street
St. Louis 6, Missouri

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

SHEET, MAGNESIUM

The Dow Chemical Company
Magnesium Department
Midland, Mich.

White Metal Rolling & Stamping
82 Moultrie Street
Brooklyn 22, N. Y.

SHEET, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

SOLDER, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

American Solder & Flux Co.
19th and Willard Sts.
Philadelphia 40, Pa.

SPOOLED ALUMINUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Ave.
White Plains, N. Y.

STORM DOOR CLOSURES

Lake Park Metal Stamping Inc.
1122 Velma Court
Youngstown, Ohio

STORM DOOR LATCHES

Lake Park Metal Stamping Inc.
1122 Velma Court
Youngstown, Ohio

STRUCTURALS, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Wm. L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Precision Extrusions, Inc.
721 East Green Street
Bensenville, Illinois

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

THORIUM METAL

Davison Chemical Co., Div.
of W. R. Grace & Co.
Erwin, Tenn.

Dominion Magnesium, Ltd.
Suite 1505, 320 Bay St.
Toronto, Canada

TITANIUM, POWDER

United International Research, Inc.
Long Island City 1, N. Y.

TOOLING PLATE, MAGNESIUM

The Dow Chemical Co.
Magnesium Dept.
Midland, Mich.

TREAD PLATE, MAGNESIUM

The Dow Chemical Co.
Magnesium Dept.
Midland, Mich.

TRIM, ALUMINUM

The William L. Bonnell Co.
Newnan, Ga.

TUBING, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Wm. L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Hygrade Metal Moulding Mfg. Co.
778 Glenmore Ave.
Brooklyn 8, N. Y.

Jarl Extrusions, Inc.
Linden Avenue
East Rochester, New York

Perry Kilsby Inc.
2501 S. Malt Ave.
Los Angeles 22, Calif.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Olin Aluminum
400 Park Avenue
New York 22, New York

Precision Extrusions, Inc.
721 East Green Street
Bensenville, Illinois

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Revere Copper & Brass, Inc.
230 Park Ave.
New York 17, N. Y.

Reynolds Metals Company
2500 South Third Street
Louisville 1, Kentucky

Southern Extrusions Company
North Washington Street
Magnolia, Arkansas

R. D. Werner Co., Inc.
Dept. 41
Greenville, Pa.

White Metal Rolling & Stamping
82 Moultrie Street
Brooklyn 22, N. Y.

Wolverine Tube
Div. Calumet & Hecla, Inc.
17200 Southfield Rd.
Allen Park, Mich.

TUBING, MAGNESIUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Dominion Magnesium, Ltd.
320 Bay Street
Toronto, Ont., Canada

The Dow Chemical Company
Magnesium Department
Midland, Michigan

White Metal Rolling & Stamping
82 Moultrie Street
Brooklyn 22, N. Y.

TUBING, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

Wolverine Tube
Div. Calumet & Hecla Inc.
17200 Southfield Rd.
Allen Park, Mich.

VENETIAN BLIND STOCK

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Reynolds Metals Company
2500 South Third Street
Louisville, Kentucky

WIRE, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Kaiser Aluminum & Chemical Sales
919 No. Michigan Ave.
Chicago 11, Ill.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Reynolds Metals Company
2500 South Third Street
Louisville, Ky.

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Conn.

White Metal Rolling & Stamping
82 Moultrie Street
Brooklyn 22, N. Y.

WIRE, PRECISION SPOOLED, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Ave.
White Plains, N. Y.

WIRE DRAWING COMPOUNDS

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

EQUIPMENT

ANODIZING EQUIPMENT

Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

The Meaker Co.
1629 S. 55th Ave.
Chicago 50, Ill.

The Gilbert Tramer Co.
1217 Main
Cleveland, Ohio

BARREL FINISHING EQUIPMENT

Hanson-Van Winkle-Munning Co.
Matawan, N. J.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

BEARINGS

Morgan Construction Co.
Worcester, Mass.

BELT GRINDERS, ABRASIVE

Hammond Machinery Builders
1600 Douglas Ave.
Kalamazoo, Michigan

BILLET CUTTERS

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Loma Machine Manufacturing Co.
114 East 32nd Street
New York 16, New York

Ty-Sa-Man Machine Co.
Box 1269
Knoxville 1, Tenn.

Wells Manufacturing Corp.
430 Service Road
Three Rivers, Mich.

BILLET HEATERS

Granco, Inc.
317 32nd St., S.W.
Grand Rapids 8, Mich.

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.

Magnethermic Corporation
3990 Simon Road
Youngstown 7, Ohio

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Pittsburgh Induction Heating
Co., Inc.
615 Washington Rd.
Pittsburgh 28, Pa.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

BUFFING & POLISHING EQUIPMENT

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

Hammond Machinery Builders
1600 Douglas Ave.
Kalamazoo, Michigan

Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

BUFFS AND WHEELS

Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

CANISTERS, GRAPHITE

Becker Brothers Carbon Co.
3450 S. Laramie Ave.
Cicero 50, Ill.

CASTING EQUIPMENT, BILLET

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

CASTING MACHINES CONTINUOUS

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, New York

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

COLD DRAW EQUIPMENT

The Aetna-Standard Engineering C
Frick Building
Pittsburgh 30, Pa.

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

OUR CORRECTING CHINES

Engineering Co.
National Bank Bldg.
burgh 22, Pa.

IBLES, MELTING, MAGNESIUM

alloy Products Co.
5 42nd St.
g Island City 5, N. Y.

h Crucible Steel Co.
1 Conant Ave.
roit 11, Mich.

ING MACHINES

nann Engineering Co.
-20 Myrtle Ave.
hmond Hill 18, N. Y.

Machine Mfg. Co., Inc.
E. 32nd St.
w York 16, N. Y.

er Machine Tool Inc.
Adeline St.
w Haven, Conn.

a-Man Machine Co.
x 1269
oxville 1, Tenn.

TING MACHINES, WIRE

wer Machine Tool Inc.
5 Adeline St.
w Haven, Conn.

-OFF MACHINES

rican Roller Die Corp.
510 Clayton Avenue
ickliffe, Ohio

mann Engineering Co.
5-20 Myrtle Ave.
chmond Hill 18, N. Y.

a Machine Mfg. Co., Inc.
4 E. 32nd St.
w York 16, N. Y.

igan Roll Form, Inc.
09 Hubbell
troit 28, Mich.

er

OVENS, AGING

The Carl Mayer Corp.
20800 Center Ridge Rd.
Cleveland 16, Ohio

The Lanly Co.
2800 Euclid Ave.
Cleveland 15, Ohio

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Young Bros. Co.
1849 Columbus Rd.
Cleveland 13, Ohio

OVENS, HEAT TREATING

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lindberg Engineering Co.
2446 Hubbard St.
Chicago 12, Ill.

Magnethermic Corporation
3990 Simon Road
Youngstown 7, Ohio

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

PISTON CORES

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

Piston Mold Die Co., Inc.
3879 E. Ten Mile Road
Warren, Mich.

PLATING EQUIPMENT

Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

The Meaker Co.
1629 S. 55th Ave.
Chicago 50, Ill.

PRESSES, DRAWING, FORMING, STAMPING, ETC.

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

PRESSES, EXTRUSION

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

PRESSES, FORGING

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

United Engineering & Foundry Co.
Pittsburgh 22, Pa.

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

RADIATION BADGES

Picker X-Ray Corp.
25 S. Broadway
White Plains, N. Y.

RECTIFIERS

Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

RECTIFIERS—GERMANIUM & SELENIUM CO.

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

REFRACTORIES, FURNACE

General Refractories Co.
1520 Locust St.
Philadalphia 2, Pa.

REELS, PAY-OFF

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

ROLL FORMING EQUIPMENT

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

Michigan Roll Form, Inc.
8909 Hubbell
Detroit 28, Mich.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

ROLLS, ROLL FORMING

American Roller Die Corp.
29501 Clayton Ave.
Wickliffe, Ohio

Brunken & Goodwin Tool Engineering
7 North Second St.
Maywood, Ill.

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

ROLLING MILLS

The Aetna-Standard Engineering Co.
Frick Building
Pittsburgh 30, Pa.

E. W. Bliss Company
Salem, Ohio

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

Morgan Construction Co.
Worcester, Mass.

Stanat Mfg. Co.
500 Shames Drive
Westbury, N. Y.

United Engineering & Foundry Co.
Pittsburgh 22, Pa.

ROLLING MILL AUXILIARY EQUIPMENT

The Aetna-Standard Engineering Co.
Frick Building
Pittsburgh 30, Pa.

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Morgan Construction Co.
Worcester, Mass.

Stanat Mfg. Co.
500 Shames Drive
Westbury, N. Y.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

United Engineering & Foundry Co.
Pittsburgh 22, Pa.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

SAW BLADES, CIRCULAR

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Heinemann Saw Corp.
Canton 6, Ohio

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

SAWS, BAND

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

SAWS, CIRCULAR

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Oliver Machinery Co.
445 Sixth St., N.W.
Grand Rapids 2, Mich.

Ty-Sa-Man Machine Co.
Box 1269
Knoxville 1, Tenn.

SAWS, CUT-OFF

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Loma Machine Mfg. Co.
114 E. 32nd St.
New York 16, N. Y.

Oliver Machinery Co.
445 Sixth St., N.W.
Grand Rapids 2, Mich.

Ty-Sa-Man Machine Co.
Box 1269
Knoxville 1, Tenn.

SAWS, MITRE

LeTarte Metal Specialties Co.
18105 E. Nine Mile Rd.
East Detroit, Mich.

SAWS, RADIAL ARM TYPE

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Ty-Sa-Man Machine Co.
Box 1269
Knoxville 1, Tenn.

SCALPERS, INGOT

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

SHEARING EQUIPMENT

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

United Engineering & Foundry Co.
Pittsburgh, Pennsylvania

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

SHEET CASTING MACHINES, CONTINUOUS

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

SHELL MOLDING PATTERNS

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

SLITTING EQUIPMENT

The Aetna-Standard Engineering Co.
Frick Building
Pittsburgh 30, Pa.

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

E. W. Bliss Company
Salem, Ohio

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

Stanat Mfg. Co.
500 Shames Drive
Westbury, N. Y.

The Yoder Company
5539 Walworth Avenue
Cleveland 2, Ohio

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

SLUG CASTERS, EXTRUSION & FORGING

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

STEAM CLEANING EQUIPMENT

Oakite Products, Inc.
50A Rector Street
New York 6, New York

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

Turco Products Inc.
6135 S. Central Avenue
Los Angeles 1, California

STRAIGHTENERS AND CUTTING MACHINES, WIRE

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

STRAIGHTENERS, SHAPED STOCK

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

STRAIGHTENERS, TUBE AND BAR

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Mackintosh-Hemphill Division
E. W. Bliss Company
901 Bingham Street
Pittsburgh 3, Pennsylvania

Mettler Machine Tool, Inc.
155 Adeline St.
New Haven, Conn.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

STRAIGHTENERS, WIRE

Mettler Machine Tool, Inc.
155 Adeline Street
New Haven, Conn.

STRETCHERS, EXTRUSION

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

STRETCHERS, SHEET

Beckmann Engineering Co.
115-20 Myrtle Ave.
Richmond Hill 18, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Ave.
New York 3, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

SWAGING MACHINES, TUBE, BAR

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

AD ROLLERS
r Machine Tool Inc.
Adeline St.
w Haven, Conn.

MING PRESSES FOR E CASTINGS
T Machinery Co.
. Greenlee Bros. & Co.
W. Eighth St.
lland, Mich.

E DRAWBENCHES
mann Engineering Co.
5-20 Myrtle Ave.
chmond Hill 18, N. Y.
a Machine Mfg. Co., Inc.
4 E. 32nd St.
w York 16, N. Y.
Yoder Co.
39 Walworth Ave.
eveland 2, Ohio

E MILLS
rican Roller Die Corp.
510 Clayton Avenue
ickliffe, Ohio

E TESTERS
mann Engineering Co.
5-20 Myrtle Ave.
ichmond Hill 18, N. Y.
er Engineering Co.
65 Empire Bldg.
ttsburgh 22, Pa.
a Machine Mfg. Co., Inc.
4 E. 32nd St.
ew York 16, N. Y.

ING ROLLS
: Aetna-Standard Engineering Co.
rick Building
ittsburgh 30, Pa.
erican Roller Die Corp.
9510 Clayton Avenue
Vickliffe, Ohio
: Lockformer Co.
617 W. Roosevelt Rd.
Chicago 50, Ill.
e Yoder Company
5839 Walworth Ave.
Cleveland 2, Ohio

RNING MACHINES, CENTERLESS
ton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

ELDING EQUIPMENT
l-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

IRE DRAWING EQUIPMENT
organ Construction Co.
Worcester, Mass.
anat Mfg. Co.
500 Shames Drive
Westbury, N. Y.

-RAY EQUIPMENT
cker X-Ray Corporation
25 S. Broadway
White Plains, New York

SERVICES

NOBRITE
ll-Brite Chemical Corp.
P.O. Box 136
Watertown, Conn.

NODIZING SOURCE
ll-Brite Chemical Corp.
P.O. Box 136
Watertown, Conn.
llmetal Weatherstrip Co.
1911 Ridge Ave.
ipco Corporation
22nd & Cole Sts.
St. Louis 6, Mo.
onversion Chemical Corp.
101 E. Main St.
Rockville, Conn.
eneral Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio
arl Extrusions, Inc.
Linden Avenue
East Rochester, New York
uaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Southern Extrusions Co.
North Washington St.
Magnolia, Ark.
Wells Aluminum Corp.
North Liberty, Ind.

ELECTROPLATING
All-Brite Chemical Corp.
P.O. Box 136
Watertown, Conn.

FABRICATING SOURCE, ALUMINUM
Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.
Anchor Metal Spinning Co.
46 Fluhart Ave.
Dayton 8, Ohio
General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio
Harvey Aluminum
Torrance, Calif.
Jarl Extrusions, Inc.
Linden Avenue
East Rochester, New York
Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.
Precision Extrusions, Inc.
721 East Green Street
Bensenville, Illinois
Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.
Reynolds Aluminum Supply Co.
573 W. Peachtree Street, N.E.
Atlanta, Georgia
Reynolds Metals Company
2000 S. Ninth St.
Louisville, Kentucky

Southern Extrusions Co.
North Washington St.
Magnolia, Ark.
Wells Aluminum Corp.
North Liberty, Ind.
R. D. Werner Co., Inc.
Greenville, Pa.
Wolverine Tube
Div. of Calumet & Hecla, Inc.
17200 Southfield Rd.
Allen Park, Mich.

FABRICATING, MAGNESIUM
Dominion Magnesium, Ltd
320 Bay Street
Toronto, Ont., Canada
The Dow Chemical Company
Magnesium Department
Midland, Michigan
Magnesium Co. of America
East Chicago, Indiana
White Metal Rolling & Stamping Corp.
82 Moultrie Street
Brooklyn 22, New York

FABRICATING, TITANIUM
Harvey Aluminum
Torrance, Calif.

FINANCING SERVICE
James Talcott, Inc.
221 Fourth Avenue
New York, New York

HEAT TREATING SERVICE
Alpha Industries, Inc.
615 Center Ave.
Logansport, Ind.

INSPECTION SERVICE
Picker X-Ray Corporation
25 S. Broadway
White Plains, New York
Turco Products, Inc.
6135 South Central Ave.
Los Angeles, Calif.

LUBRICANTS SERVICE, METALWORKING
American Charcoal Co.
201 S. Green St.
Detroit 17, Mich.
Grafo Colloids Corp.
259 Wilkes Pl.
Sharon, Pa.
Graphite Products Corp.
Brookfield, Ohio

MACHINING SERVICE
Alpha Industries, Inc.
615 Center Ave.
Logansport, Ind.

PORCELAIN ENAMELING SOURCE
Ferro Corporation
4150 E. 56th St.
Cleveland 5, Ohio

SLITTING
Fairmont Aluminum Co.
Fairmont, W. Va.
Metal Slitters, Inc.
113 Key Highway
Baltimore 30, Md.
Quaker State Metals Co.
Manheim Pike at 230 Bypass
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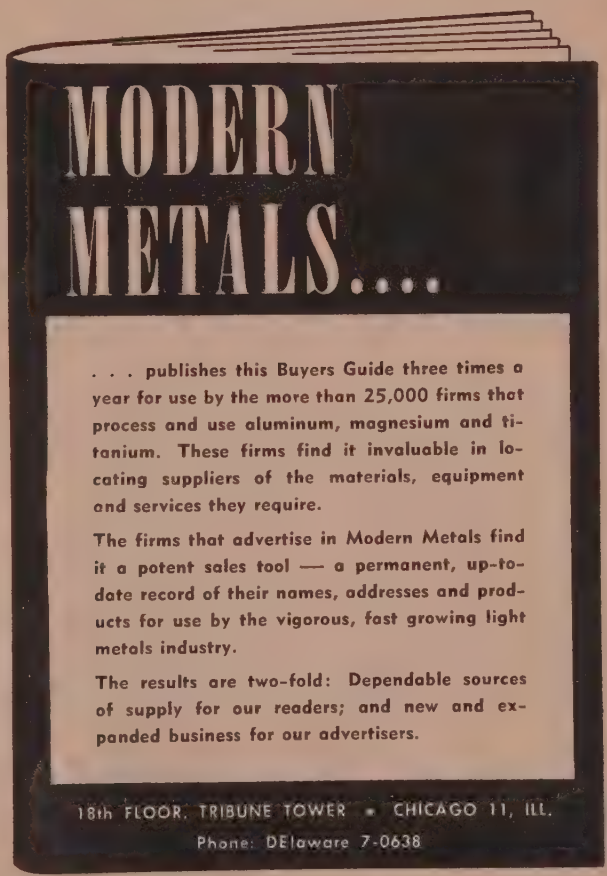
Atlanta, Georgia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The firms that advertise in Modern Metals find it a potent sales tool — a permanent, up-to-date record of their names, addresses and products for use by the vigorous, fast growing light metals industry.
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Magnesium-Thorium Hardener

TYPICAL ANALYSIS*

Component	Analysis (%)
Th	20 or 40
Fe	0.05
Ni	0.002
Cr	0.02
Mn	0.15
Cu	0.02
Si	0.005
Al	0.005
Pb	0.01
Rare Earths (total)	0.01

*Analysis based on the use of magnesium of ASTM B-92-52 specification. Alloys with higher purity magnesium also available.

Thorium Hardener Extends Magnesium's Service Temperature Range to 750° F.

Magnesium-thorium alloys withstand heat so well that they are being used for sheet, extrusions and castings in many of today's missiles. Continuing research indicates that they will have greatly expanded uses where service temperature is a factor.

Davison is the only domestic producer of magnesium-thorium hardener. It is manufactured at Erwin, Tennessee, by a unique process which eliminates slag and oxide inclusions. Thorium hardener, supplied in ingots, is easily added to magnesium to produce the alloy desired.

Magnesium-thorium hardener is available in the following forms:

25 lb. Notched Ingots
100-300 lb. Round Ingots

Davison also offers a disposal service for scrap thorium products.

If you are interested in magnesium for missiles, aircraft, or for other uses where temperature is a factor, it will pay you to investigate Davison's magnesium-thorium hardener. Direct your inquiry to the address below.

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ERWIN, TENNESSEE

Looking Ahead

Another aluminum investigation may be in the making. At least, the Yates Committee has been making noises that sound like a prelude to a new spate of hearings. Justification will be, of all things, predictions of another aluminum shortage just around the corner. In a report issued late last month, the committee observed that "in the very near future the demand for aluminum will increase tremendously and the present overabundant supply will disappear." The committee bases this somewhat surprising conclusion on recent news of vastly increased uses in autos, construction, appliances, etc., and it reasons that another shortage will work to the serious disadvantage of small businesses that use aluminum.

But the report – which contains little that cannot be found in the committee's previous report – ignores the present supply situation. Primary production in December set a new record of over 152,000 tons, and January output probably topped 155,000 tons. Translating this to an annual rate, it comes out to a solid 180,000 tons per year above the 1956 level, which was aluminum's best year. What's more, this new record level is being achieved with the industry running at about 80% of capacity. And when all announced primary aluminum expansion plans are completed, the rated capacity of the U. S. industry will stand at a lofty 2,604,500 tons annually.

The global picture is even more striking. Present world capacity is estimated at 4,500,000 tons annually. Adding up expansion plans in North America, Europe, the Iron Curtain countries, and other areas, this total should rise 24% to 5,600,000 tons by the end of 1961. In the face of a generally "soft" market for the metal in some major aluminum consuming countries, the likelihood of another shortage in the near future seems remote, to say the least.

But the Yates Committee report notes that "All evidence points to . . . a tight market in the relatively near future." Based on this, plus the committee's assumption that small firms would be "squeezed out" in the event of a shortage, the report comes up with three recommendations. They are: That the committee continue its study of the aluminum situation; that the government continue its efforts to amend its contracts with the producers so that small firms will be assured a larger supply; and that small firms consider the possibility of pooling their resources and organizing a "buying corporation" that could arrange long term contracts with the primary producers.

The first recommendation sounds like groundwork for a new set of hearings. Other committees of Congress have, in the past, shown a peculiar reluctance to bury an issue, even after rigor mortis has set in. Some small independent fabricators of aluminum may be in grave danger, but we find it hard to accept the committee's conclusion that the danger stems from an impending shortage.

As for the second recommendation, something is being done. Late last month, for example, Alcoa and General Services Administration agreed on an amendment to the expansion supply contracts that specifically earmarks a certain amount of metal to small business. The contract originally provided that Alcoa would set aside 25% of the capacity of its fast-amortized facilities for non-integrated users. In 1957, the set-aside was upped to 35%. And last month, that additional 10% was specifically allotted to small business concerns, as defined by the Small Business Act.

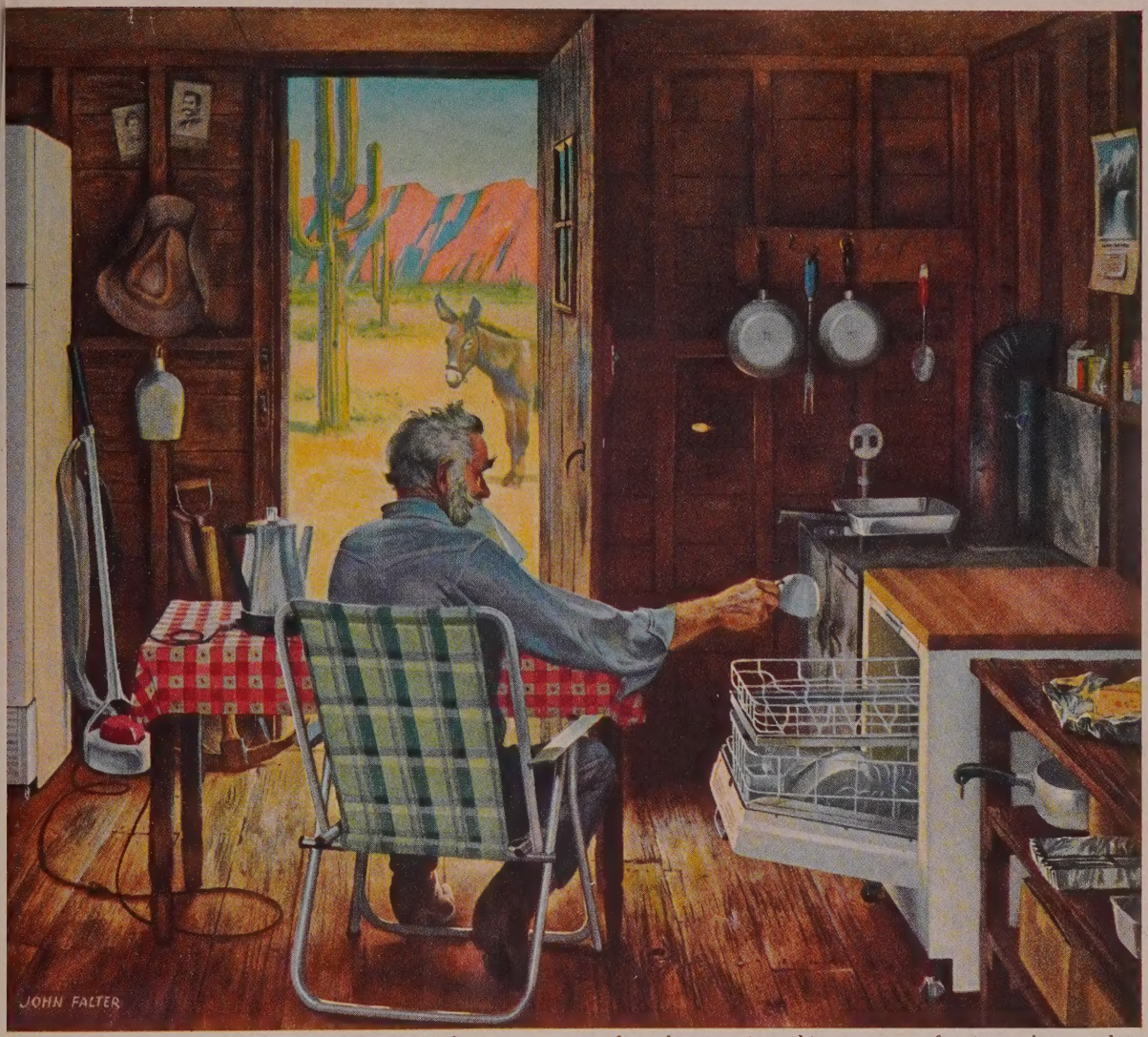
Alcoa will offer 6000 tons of pig, ingot and billet quarterly to small business, beginning in the first quarter of '59 and continuing through the first quarter of 1972. Smaller quantities will be made available thereafter through the second quarter of 1973, when the contract expires. Alcoa vice president Don Wilmot noted that "This provision . . . carries out the recommendations . . . by a subcommittee of the House Small Business Committee during hearings on the aluminum industry in 1958." It is understood that GSA is also dickering with the other producers in order to get similar concessions.

The "buying corporation" recommended by the committee would probably be welcomed by the primary producers. Certainly, it would be to their advantage to work out substantial long-term contracts with the non-integrated fabricators. They could probably realize some attractive savings in bookkeeping alone. What's more, they would probably get this whole problem off their necks. But from what we've learned about small business in our 14 years in this business, it's hard to see these non-integrateds getting together on anything as important as metal buying. But you can't completely rule out the possibility of some sort of joint purchasing arrangement in the future.

Aluminum ingot sales were strong in February, and the outlook is the brightest it's been in a long time. Shipments of sheet, however, were off sharply in January. Though sheet sales began to perk up in mid-February, total rolled products capacity is still twice as high as demand.

Chrysler is on the prowl for a hot metal deal. They're tooling up 6- and 8-cylinder aluminum engines for their 1961 models, and want to reap the hot metal economies that Ford and G.M. presently enjoy at Reynolds smelters.

— The Editors



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With the industry geared to sales of about 290,000,000 major appliances over the next 10 years, it is estimated that our aluminum needs for consumer goods will increase by 30%.

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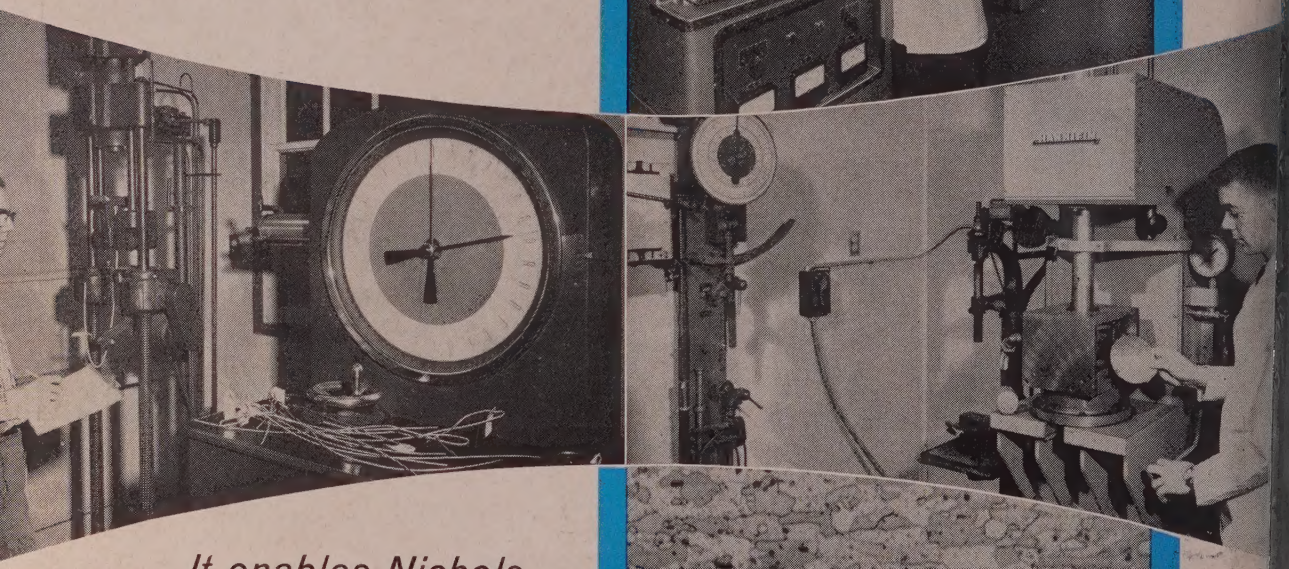

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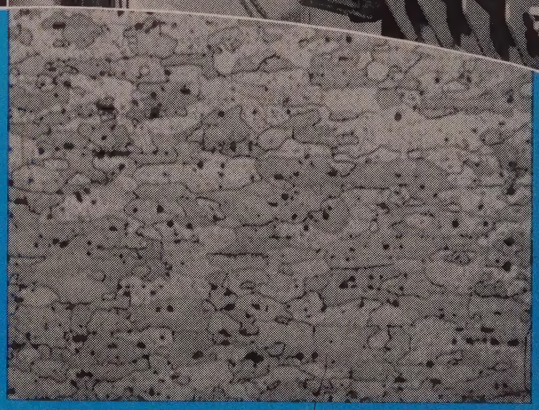

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